COVER FOR
CAREER DEVELOPMENT VOLUME

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Section 1. Introduction to the NASA Cost Estimator Career Development Guide

This NASA Cost Estimator Career Development Guide is based in part on the NASA Chief Financial Office Career Development Guide and has been tailored to fit the needs of NASA Cost Estimators. The Cost Analysis Division of the Office of Program Analysis and Evaluation (PA&E) has the responsibility for maintaining this document. This guide is intended for NASA employees working at Centers or Headquarters whose major duties include cost estimating, whether assigned to a staff office, an institutional office, a project office, or a program office.

Cost Estimating is a methodology that involves the application of quantitative techniques to calculate and forecast development, production, operation and support, and disposal costs (i.e., life-cycle costs) within a scheduled time frame and defined scope. Included in these costs are an assessment and evaluation of risks and uncertainties. Cost estimators are responsible for preparing or obtaining a Work Breakdown Structure (WBS), gathering, normalizing, and verifying cost data, developing cost estimating relationships (CERs), evaluating specific elements of costs, and evaluation of the reasonableness and appropriateness of the cost data. NASA cost estimators follow this methodology for the development of cost estimates for space system hardware, space system software, construction of facilities, and research and development of technology (R&T). The results are used to assist decision makers in determining the optimal use of resources and to make cost-effective decisions throughout the life cycle. If this describes the type of work you do, this Guide may be helpful to assist you in planning your career and planning associated training. Refer to Appendices A and B for a list of job titles and corresponding job series and applicable job category definitions.

This guide is consistent with the NASA Competency Management System (CMS), the web application used to collect, manage and report on the workforce competencies as they relate to people, positions, and projects. CMS is an additional resource to aid cost estimators in career development. In addition, NASA has several offices that support training needs, which personnel should be familiar with. Brief descriptions of these resources are listed below, along with links to web pages:

- **The NASA Office of Human Capital Management** is responsible for keeping pace with the changing demands of NASA's work and its workforce. NASA's workforce is a primary focus of the Office of Human Resources in maintaining NASA's position as an employer of choice. The NASA Office of Human Capital Management webpage is available at: http://nasapeople.nasa.gov

- **The NASA Agency Training and Development Office** extends opportunities to help employees gain the necessary knowledge and skill to fulfill NASA's mission

through formal education, training, and on the job developmental experiences. The organization is responsible for the Agency's overall leadership development training needs serving all NASA Centers, Mission Directorates, and Mission Support organizations. This office works in collaboration with Center training offices, HQs functional offices, and stakeholders in the SATERN on-line learning environment to ensure that employees receive opportunities to build their professional development in three main areas: Building Leaders, Building Technical Excellence, and Building Effective Organizations. Effort in these areas is focused on results through fostering a culture of honesty, learning, and knowledge sharing. The NASA Agency Training and Development Office webpage is available at: http://nasapeople.nasa.gov/training

- **System for Administration, Training and Educational Resource for NASA (SATERN)** is NASA's Learning Management System that offers Web-based access to training and career development resources. NASA employees must use this SATERN to register for web-based and classroom training, as well as for conferences. A user name and password is required to enter the site. The SATERN web page is available at: https://saterninfo.nasa.gov/

- **NASA Centers' training site links:** Each NASA Center has a career development and training resource site for employees. These are also good tools for cost estimators to review, as some sites are better than others. The information is available at the following web page: http://nasapeople.nasa.gov/Training/other_sites.html

1.1 Using This Guide

To obtain maximum benefit from this guide, follow these steps:

Step 1: Read and review this document

Task 1. Read Sections 1-10 of this guide to learn about:
- Philosophy on NASA cost estimator career development
- General Career Paths available within the NASA cost estimating community
- Tailoring your NASA Cost Estimator Individual Development Plan (IDP)

Task 2. Review the general competencies and associated training and developmental experiences identified in Appendix C.

Step 2: Examine your career situation

Task 1. Refer to Section 7 and Appendix B to select the job category and career stage that best describes your current position.

Task 2. Refer to Appendix D and thoroughly review the suggested technical competencies for cost estimators presented by career stage, entry level, journey level, senior level, and executive level.

Note: The technical competencies are cumulative. For example, individuals at the journey level are expected to master all pertinent knowledge/skills at the entry and journey levels. Similarly, individuals at the senior level are expected to master all pertinent knowledge/skills at the entry, journey, and senior levels.

Task 3. Identify the knowledge/skills you possess and can demonstrate through achievement of the related learning objectives. Simultaneously, identify the pertinent knowledge/skills required for effective job performance.

Step 3: Identify the training and other developmental experiences that you need

Task 1. See Appendix E for the core curriculum relating to the technical competencies for cost estimators presented by career stage.

Task 2. Identify relevant training and other developmental experiences required to potentially improve your job performance and to advance your career.

Refer to Appendix D for a comprehensive list of all available training for the technical competencies relating to cost estimators presented by career stage and knowledge/skill.

Refer to Appendix C for available courses relating to general competencies.

Step 4: Prepare Your Individual Development Plan

Task 1. With your supervisor, jointly prepare an Individual Development Plan (IDP). An example of a Cost Estimator IDP is located in Section 10 of this guide.

Task 2. Periodically review the IDP for progress and potential adjustments. Reviews on a semi-annual basis are encouraged.

Step 5: Ongoing Mentorship

If you have a mentor(s), discuss your assessment with the mentor(s) and solicit his/her thoughts concerning your progress and potential training and developmental experiences. If you do not have a mentor(s), in consultation with your supervisor, identify individual(s) who possess the requisite knowledge and aptitude to serve as a mentor and seek their support.

1.2 Purpose

The purpose of the NASA Cost Estimator Career Development Guide is to outline the process for developing the NASA cost professional from a new hire to an executive capable of leading NASA cost estimation and analysis offices, as well as for developing cost estimators in all other career stages. This guide is intended to provide resources to NASA cost professionals to identify a career path, enhance career development, prepare individuals for advancement to the next level of their career, and align skills and capabilities with organizational needs to ensure that qualified

individuals are available to meet mission requirements. The NASA Cost Estimator Career Development Guide provides the members of the NASA cost community with a consolidated reference document that:

- Suggests a general road map for continuing professional development
- Provides employees with a comprehensive list of general and technical competencies required to perform the major tasks in their occupation and to plan their careers
- Offers employees and their supervisors a consolidated reference document to identify and sequence training and other developmental activities when preparing an IDP
- Assists supervisors in making effective use of training resources by identifying competencies and training courses to aid employees' attendance at appropriate courses

Section 2. Cost Estimator Career Development Philosophy

Career development is a process where employees strategically explore, plan, and create their future at work by designing a personal learning plan to achieve their potential and fulfill the organization's need for a vital and effective workforce. Career development involves continual learning, seeking new opportunities, taking risks, and finding ways to contribute to the organization in a productive and motivated fashion. Its purpose is to enhance current performance and enable individuals to take advantage of future opportunities.

Professional development is a shared responsibility of the employee and supervisor. In order to design a successful career, each employee needs to take responsibility to create a career development plan and initiate actions that will lead him/her to a career goal. To optimize current and future employee contributions, supervisors and managers must be actively involved with their employees in developing their career plans. This involvement includes periodic assessments of each employee's knowledge, skills, abilities, and experience. This assessment may lead to the generation of an IDP, identifying work assignments, training, and other developmental experiences that promote reaching NASA and employee goals.

Professional development for an individual should contribute to improved performance. Career development, however, does not directly correlate to a promotion or an increase in pay -- there are no guarantees. A career path is a personal decision and career choices are what you make of them. The more this guide, career resources, mentors and your leadership guidance are leveraged, the more the estimator will gain from the process to enhance their career. Members of the NASA cost estimating community are encouraged not only to maintain a current set of skills, but to continually seek out opportunities to stay abreast of the industry, learn new or enhance their skills set, and to consider their continued professional education, as well as obtaining certification by one or more of the relevant organizations listed in Section Nine.

In establishing a cost estimator career development template, personnel in similar disciplines will share tools and approaches and should become "universally assignable" across the Agency. Common tools and approaches will improve efficiency, decrease turnaround times, reduce down time, improve customer service, and cut costs.

Section 3. Leadership Development Philosophy

The challenges facing the NASA cost estimating community require a cadre of skilled and motivated leaders dedicated to creating and sustaining a new culture to enable safe, successful, and affordable mission accomplishment. Successful leaders have a compelling vision and clear intention for the future that draws others to join them and to co-create that future. Research clearly demonstrates the imperative that leaders generate trust, requiring relationship building and a constancy of behavior. Another critical leadership competency is management of self by knowing one's skills, leveraging one's strengths, and deploying them effectively. A successful cost estimator leader should combine technical expertise with skill in relating to others, leading change, and leading others.

An effective leader values continuous learning and mastering achievement. Enhanced learning occurs in the context of a learning community where all members support each other's career and leadership development goals.

Employees in the NASA cost estimating community are strongly encouraged to take advantage of Center and Agency-sponsored leadership development programs and to continually enhance their leadership skills through other appropriate means, including developmental assignments. Additional information regarding Agency-level policy and programs for leadership development is accessible at the NASA Leadership and Management Development Home Page and in Appendix C.

Section 4. Minimum Actions to Ensure Effective Career Development

Career development, whether focused on leadership development or development of functional expertise, is a shared responsibility among employees, managers, and the organization. The following list identifies recommended minimum actions each NASA component should take to ensure effective career development:

Employees:

- Determine professional goals for today, as well as five and ten years in the future
- Assess their aptitudes, strengths, and development needs with their mentor(s) and supervisor
- Seek mentor and supervisor input and prepare an IDP, if necessary, that supports both their current job requirements and their long-term professional goals
- Work with their supervisor to schedule appropriate on-the-job training, complementary formal training, and other developmental activities as required

(See Section 10 for guidance on the Cost Estimator IDP and instructions on how to prepare an IDP. Appendices C and E identify specific training and developmental experiences for the general and technical competencies, respectively)

Managers:

- Support the development and training of their subordinates, providing opportunities to discuss career goals and plans with every employee
- Determine the job-related knowledge, skills, abilities and experience employees need to effectively accomplish the work of the organization and achieve career development goals
- Mentor and coach employees in their professional development planning (See Appendix H)
- Help the employee define the short-term and long-term development and training needs

Organizations:

- Ensure an organizational structure exists that supports the required knowledge, skill, ability, and experience development of its employees
- Provide resources – dollars and time – for development to occur
- Provide a clear road map for career development activities
- Utilize the talents, abilities and resources of each employee in support of organizational goals
- Develop a proactive and realistic approach to meet future staffing needs

Section 5. Career Directions and General Career Paths

The combination of individual career preferences and organizational opportunities shape the direction of an employee's career. The proficiency of an individual is a reflection of three aspects of career development: on-the-job training, formal training courses, and developmental experiences/activities. Career paths identify job progression opportunities and provide employees with assistance in pursuing their career goals. This section of the guide explains the primary career path within the NASA cost estimating community (see Figure 1). Studying this path will lead to a better understanding of available career options and will result in more effective career planning.

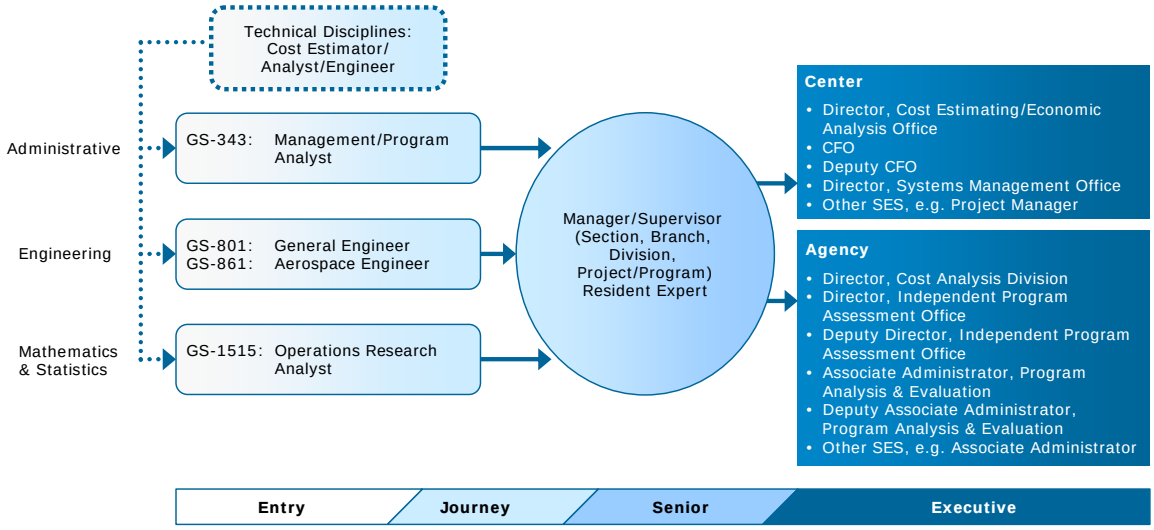

Figure 1. General Career Paths

5.1 Career Stages

The NASA cost estimator career development model consists of four career stages, reflecting increased responsibilities and performance expectations as employees move through each stage in their career. The NASA cost estimator career development model defines the technical competencies using these stages, as follows.

Entry:

- Performs fundamental, basic, and routine cost estimation and analysis activities while gaining knowledge and experience
- Applies knowledge and training under direct supervision and direction

Journey:

- Functions independently or as part of a team, applying cost estimating and analysis knowledge and experience to variety of complex problems
- Identifies gaps in knowledge ands seeks training, performs research etc., to fill those gaps

Senior:

- A recognized cost estimator expert with broad scope of responsibility and high visibility
- Senior expert in the field of cost estimation and analysis who operates as a team leader or supervisor with broad scope and responsibility; or individually as the cost consultant for a major Agency component, such as a mission directorate, program, project or functional organization
- Can identify and recruit other cost experts to fill gaps in knowledge and experience

Executive:

- A leader in the NASA cost community responsible for strategic management of the cost estimation and analysis function
- Defines and implements Agency-level policy and guidance on cost estimating and analysis

Section 6. General and Technical Competencies

This guide defines the types of competencies that are required for NASA employees in the NASA cost estimating community. The guide differentiates between general and technical competencies and the general competencies are aligned with the competencies in the NASA Leadership Model.

Figure 2 illustrates that effective performance and career growth within the NASA cost estimating community involves the successful integration of career experience with general competencies, technical competencies and demonstration of key attitudes.

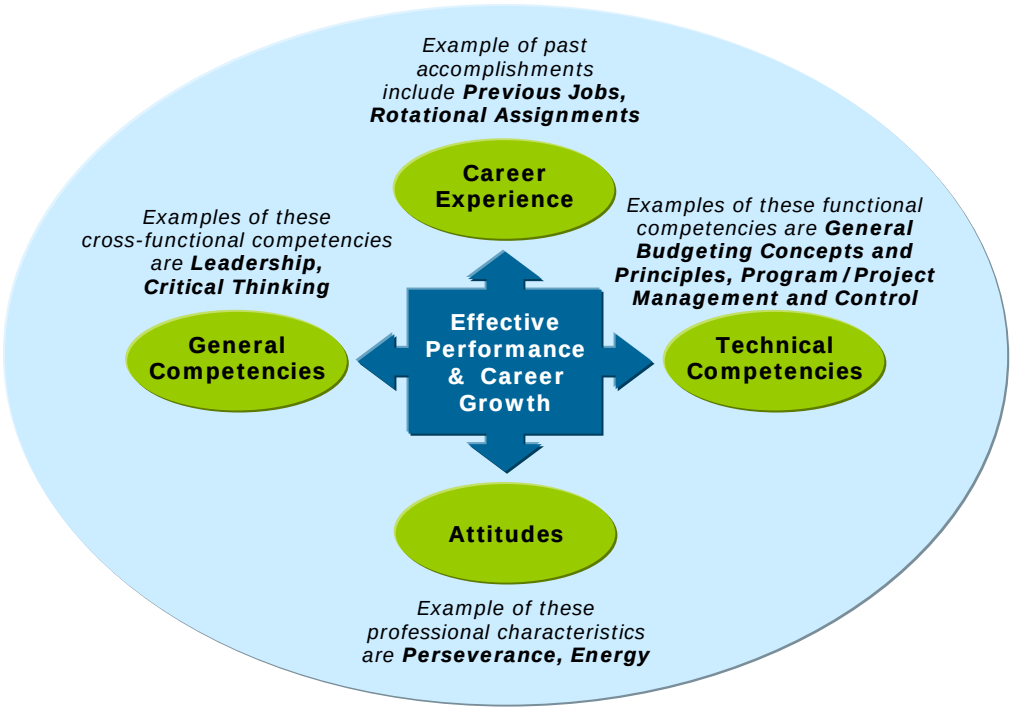

Figure 2. Career Growth Integration

Both general and technical competencies consist of multiple knowledge/skills that are required to achieve success in job performance. Knowledge/skills are measured by the achievement of learning objectives that reflect the expected performance level required to be competent. To appreciate all relevant competencies needed to perform one's job effectively, an employee must address both general and technical competencies for his/her job category.

A matrix that identifies general competency training can be found in Appendix C. The technical competencies, arrayed for cost estimators by career stage, are defined in Appendix D. Attitudes are discussed in Section 7.0 of this guide.

Section 7. Attitudes

Attitudes are pre-dispositions to behaving in a certain way. Sometimes they are manifestations of innate talents. In other instances, they are learned through life experiences. Normally, training does not affect attitudes in any substantial way. Nevertheless, attitudes can change through perseverance and practice. One of the most successful management books, *7 Habits of Highly Effective People* (by Stephen Covey), emphasizes that attitudes can be developed.

Attitudes, although observable, are very difficult to measure. Despite this fact, highly successful managers in the cost estimating community agree that the following attitudes are required to excel in the NASA cost estimating community:

- Portability – flexibility, adaptability and willingness to accept rotational assignments
- Energy – demonstrates positive presence
- Willingness to learn – seeks new opportunities and challenges
- Independence – individual contribution is valued regardless or working alone or on a team
- Perseverance – patience and application of new ideas to accomplish difficult tasks; willingness to ask hard questions

Section 8. Training and Development Experiences

To support the full utilization of the NASA workforce in achieving NASA's strategic outcomes, it is Agency policy to make training and developmental opportunities widely available to employees to:

- Improve organizational performance
- Maintain scientific, professional, technical, and management proficiency
- Build and retain a skilled and effective workforce
- Enhance individual capabilities.

More specifically, NASA policy is to:

- Use on-the-job-training through selected work experiences as the primary method of developing the job-related knowledge, skills, and abilities of employees
- Support systematic plans to broaden employees' knowledge and skills through planned, work-related developmental assignments including "on-the-job" training, rotational assignments, and non-NASA work experiences
- Use formal training and educational experiences to complement work experiences
- Provide new supervisors with at least 40 hours of supervisory and management training within six months of their assignment, 80 hours within the first two years, advanced training for all supervisors and managers as needed, and continual development and training for senior executives
- Support employee training, retraining, and organizational development activities leading to better ways of delivering services, improving work performance, and increasing the value of employee contributions to current and future Agency missions

Appendix C suggests the type of training and developmental experiences to demonstrate the general competencies. Appendix E identifies course areas that are considered "core." Employees, in coordination with their mentor and supervisor, should select those classes relevant to their unique developmental needs.

Developmental Activities

Developmental activities are structured work/training experiences, agreed to between employee and supervisor, with well-defined objectives intended to enhance job knowledge and skills. Some people refer to developmental activities as a combination of structured "on-the-job" activities and formal classroom training. Some developmental experiences are designed to broaden an employee's knowledge and understanding of the Agency through a combination of expanded work experiences and formal training. Others may be particularly related to specific job requirements, when skill enhancement is required to properly perform a task.

Developmental work assignments, with appropriate levels of responsibility, can be beneficial to developing the competencies required of all NASA employees in the cost estimating community. Developmental assignments can involve short work assignments outside one's own organization, but inside the Center. When broad and insightful knowledge of Agency management and

program operations is required, developmental work assignments outside of the home Center are an effective means of acquiring this experience.

Refer to Appendix C for additional information on Agency and inter-Agency developmental opportunities.

Rotational Assignments

Rotational assignments are a type of developmental experience. Rotational assignments benefit both the organization and the individual. As the federal workforce continues to experience streamlining pressures, generalists with greater breadth and depth of knowledge and skills are increasingly in demand because of their flexibility and adaptability to new challenges. These employees experience more intrinsic and extrinsic benefits in terms of job challenge, satisfaction and visibility; greater recognition and awards; enhanced promotional opportunities; and increased marketability.

There are many types of rotational assignments. Some examples are:

- Cross-disciplinary, i.e., between cost estimating and engineering, cost estimating and resources management, between cost estimating and acquisition, etc.
- Across cost estimating support functions, i.e., between institutional or staff support and direct project support
- Assignment of tasks outside of normal responsibilities and within the current work unit

Rotational assignments can occur within a Center, between NASA Centers, on an interagency basis, between the public and private sectors, as well as between segments of the public sector (federal, state, and local). In the IDP process, consideration should be given to identifying rotational assignments that involve realistic and attainable goals that will benefit both the individual and the organization.

Refer to Appendix C for detailed information on the types of rotational and other developmental assignments presently available to the NASA cost estimating workforce.

Formal Training Activities

Formal training activities supplement the development of general and technical competencies. Each formal training activity usually consists of a well-defined lesson plan, specific training objectives, and a clear definition of learning objectives. The delivery of training may take one of several formats, and may be delivered by training providers or NASA subject matter experts:

- Classroom-based training
- Telephone-based training
- Computer-based training
- Intact work team training
- "Train-the-Trainer"
- Self-study, e.g., correspondence
- Video/satellite-based training
- Web-based
- Video and audio tapes

System for Administration, Training and Educational Resource for NASA (SATERN) is NASA's Learning Management System that offers Web-based access to training and career development resources. NASA employees must use this SATERN to register for web-based and classroom training, as well as for conferences. A user name and password is required to enter the site. The SATERN web page is available at: https://saterninfo.nasa.gov/.

The Academy of Program/Project Engineering Leadership (APPEL) offers classroom-based training at NASA Headquarters and at the NASA Centers focusing on many aspects of project management. Many of its courses apply to members of the NASA cost estimating community. Information on APPEL courses is available at: http://appel.nasa.gov/node/17.

Additional information on NASA-wide training opportunities is available at http://nasapeople.nasa.gov/training/.

A list of the training providers that have been identified in this Guide and their web sites can be found in Appendix G.

Section 9. Certification and Continuing Professional Education

Achievement of professional certification, as well as continuing professional education, enhances the cost estimating workforce of the Agency. Continuing professional education improves job performance and can lead to certification. An employee's commitment to education reflects the pride placed in one's chosen profession. Professional certification and continuing professional education allow employees to create networks for personal benefit and organizational gain. For example, employees enhance their general and technical competencies while adopting a bigger picture perspective. In turn, the organization can benefit by adopting best practices successfully implemented by other organizations.

Certification is a process that formally recognizes professional workers for achieving expertise and excellence in their field and is a means to encourage employees to continue their education and hone their professional skills. Cost Estimating related certification programs are primarily sponsored by professional associations. Certification requirements typically consist of specific types of formal education and experience, character references, and passing of an examination. To maintain certification, there may also be a continuing education requirement. Since certification provides recognition for achievement of professional excellence, NASA encourages its cost estimators to seek certification appropriate to their occupation.

There are several professional associations offering certification to cost analysts. Members of the NASA cost estimating community are encouraged to participate in one or more of these societies, as time allows.

The Society of Cost Estimating and Analysis (SCEA)

http://www.sceaonline.org

SCEA is a nonprofit organization chartered by the State of Virginia and operated by the National Officers acting under the policies of the National Board of Directors and the counsel of the Board of Regents. The Society's Certified Cost Estimator/Analyst (CCE/A) program provides a professional credential to SCEA members and nonmembers who demonstrate mastery of basic concepts and methods. The individuals achieving certification:

1. Pass a written exam testing their knowledge and skills

2. Qualify to take the exam by demonstrating nominal levels of training and work experience. SCEA regularly offers the exam three times a year, in April, June, and November, at sites across the country and internationally

Additional information is available on the SCEA website or you can contact the SCEA National office at scea@sceaonline.net or at 703-938-5090 if you have any questions about these or other matters.

International Society of Parametric Analysts (ISPA)

http://www.ispa-cost.org

ISPA is a professional society dedicated to the improvement and promotion of parametric cost modeling techniques and methodologies, risk analysis, econometrics, design-to-cost, technology forecasting, and cost management. ISPA provides a forum that encourages the professional development of its members through the interchange of ideas and perspectives. ISPA members represent government agencies, universities, and nearly 200 organizations in 12 countries. ISPA's membership ranges in experience from beginners to seasoned professionals. They are united by their interest in the practical application of parametric analysis. ISPA sponsors certification for the Certified Parametric Practitioner (CPP). Additional information is available on the ISPA website.

Space Systems Cost Analysis Group (SSCAG)

http://sscag.saic.com

SSCAG is a non-profit, international association of aerospace organizations representing industry and government. SSCAG was established in 1977 by the U.S. Air Force Space & Missile Center (SMC). It is co-sponsored by the Air Force and the National Aeronautics and Space Administration (NASA). SSCAG is a working group of space systems organizations whose representatives (1) promote cost analysis research, (2) provide a cooperative forum for government and industry discussions (3) jointly work resolution of common problems, and (4) share ideas, data, and experiences to enhance the cost analysis profession, and (5) produce valuable cost analysis products. Additional information is available on the SSCAG website.

American Institute of Aeronautics and Astronautics (AIAA)

http://www.aiaa.org

AIAA is the professional society for the field of aerospace engineering. The AIAA was founded in 1963 from the merger of four earlier societies: the American Rocket Society (ARS), founded in 1930 as the American Interplanetary Society (AIS), and the Institute of Aerospace Sciences (IAS), founded in 1932 as the Institute of Aeronautical Sciences. The AIAA is the U.S. representative on the International Astronautical Federation and the International Council on the Aeronautical Sciences. Additional information is available on the AIAA website.

Association for the Advancement of Cost Engineering (AACE)

http://www.aacei.org

AACE is an international professional society that has been on the leading-edge professional society for cost estimators, cost engineers, schedulers, project managers, and project control specialists since 1956. With more than 5,500 members worldwide, AACE International is the largest organization serving the entire spectrum of cost management professionals. AACE International is industry independent, and has members in 78 countries and 71 local sections. AACE sponsors several different certification programs, such as Cost Consultant Certification, Certified Cost Engineer, Planning & Scheduling Professional Certification, and Earned Value Professional Certification. Additional information is available on the AACE website.

American Society of Professional Estimators (ASPE) – Construction Estimating

http://www.aspenational.org/

ASPE is a professional society that serves construction estimators by providing education, fellowship, and opportunity for professional development. ASPE encourages a wide range of educational activities that provide learning experiences for estimators at all experience levels. As professionals, ASPE members are constantly seeking to improve their knowledge of estimating and the construction industry. Chapter meetings throughout the country are held and include educational talks and mini-seminars on estimating and other construction related topics. ASPE sponsors a Certified Professional Estimator (CPE) certification program for qualified applicants. Additional information is available on the ASPE website.

Section 10. Individual Development Planning

10.1 Cost Estimator Individual Development Plan

The IDP employs a concept that emphasizes discussion and joint decisions by the employee and the supervisor, with input from mentor(s), on the specific developmental experiences necessary to fulfill the mutual goals of individual career development and organizational enhancement. Each IDP is uniquely tailored to the needs of the individual and the organization. One might identify extensive skill training; another might emphasize a more academic approach. There is no set pattern -- the term "individual" is basic to the concept -- especially as it applies to the employee's willingness and capacity to learn and grow. The IDP is a personal action plan, jointly agreed to by you and your supervisor that identifies your short and long-term career goals. An IDP also identifies the training and other developmental experiences needed to achieve those goals, for the benefit of the individual and organization, within a specified timeframe.

10.2 The Benefits of Career Planning

Why should you be concerned about planning your career? It's your career. If you don't take responsibility for the success of your career, then who will? Besides, considering all the time and energy you spend at work, why not ensure you get maximum satisfaction from your work and career? Additionally, NASA benefits from having a competent and motivated workforce, capable of "re-tooling" itself to meet the demands placed on it by constant organizational and technological changes.

The workplace has been affected by a number of significant changes or trends, which have definite ramifications for your career planning:

- **Less job security:** Gone is the era of high job security, with the same employer for life, where good employees automatically move up well-defined career ladders. Even in the federal sector, in response to increased pressures to reduce costs, solutions like restructuring, down-sizing and automation will continue to eliminate some jobs and drastically alter others. Workers will, of necessity, need to be more mobile in finding the right job--and employer.
- **Up is not the only way:** With the thinning of management positions and flattening of organizational structures, the traditional linear career patterns will be less available. Employees will need to be more flexible, adaptable, and creative in identifying their next job, and may need to consider lateral moves or rotational assignments to broaden their experience or leverage their skills.
- **Technical knowledge and skills obsolescence:** Rapid advancements in technology and state-of-the-art knowledge requires employees to upgrade their skills and "re-tool" themselves just to remain current with their job requirements. For example, in high-tech organizations, some skills have a half-life of 18 months. Also, missions and projects end and new ones start up, often requiring new or different technical skills or expertise from the workforce.

It is definitely to your advantage to position yourself for long-term employability in the rapidly changing world of work. Begin preparing now for the future.

10.3 General Steps in Career Planning

Figure 3 illustrates the general steps involved in any career planning process. More detailed steps are identified in the next section, "Working the Career Planning Process."

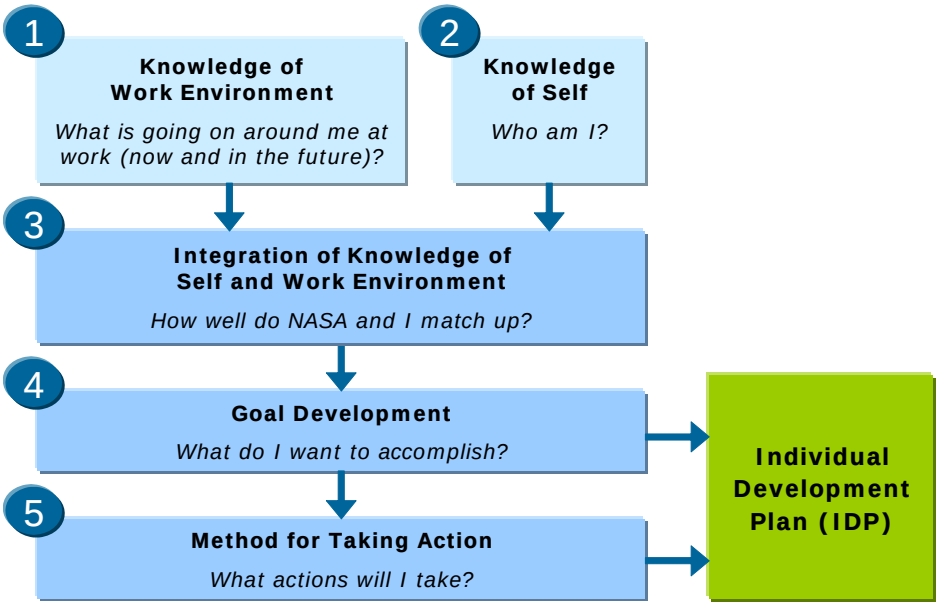

Figure 3. NASA Career Planning Steps

10.4 Working the Career Planning Process

Now that you are a little more clear about the benefits of career planning, it is time to begin working on the process. As with any major decision, you will need a certain amount of data upon which to make your career decisions. The following worksheets are designed to help you generate relevant data for each step in the process. Note that it pays to be as thorough as possible, so you may need to spend a significant amount of time at one or more steps.

- Complete the "Current Career Issues" worksheet in this section
- Assess the "big picture" and achieve a solid understanding of the current and future work environments. Complete the second worksheet in this section titled "Knowledge of Work Environment" to reflect this understanding
- Read the appropriate sections of this Guide as follows:
  - Thoroughly review the technical competencies in Appendix D for your job category to identify those knowledge/skills for which you are competent. You can consider yourself competent in a knowledge/skill if you have, or can, demonstrate achievement of all of the learning objectives associated with that skill.
  - Since the technical competencies are cumulative, it is important to review the knowledge/skills associated with the technical competencies for your current and previous career stages.
  - If you aspire to the next career stage in your job category, then review the technical competencies for that stage to identify the knowledge/skills you do and do not possess.

Using the previous example, if you are at the senior level and if you aspire to an executive level position, it would also be appropriate to read Appendix D.

  - Identify all knowledge/skills you have not achieved. Referring to Appendix E, identify the training associated with the knowledge/skills you wish to achieve. Referring to Appendix E, identify other developmental experiences that would aid your achievement of these technical competencies.
  - Similarly review Appendix C and identify the general competencies you do not possess or wish to strengthen. Again, discussions with your mentor(s) may prove useful.

- Complete the "Knowledge of Self Assessment", "Integration of Knowledge of Self and Work Environment", "Goal Development", and "Method for Taking Action" worksheets found in this section.
- Prepare a draft IDP that states your goals, includes knowledge/skills you wish to acquire or improve, your proposed actions, and your projected completion dates for each action. Identify the training and/or other developmental assignments by which you propose to acquire/improve these knowledge/skills. A suggested IDP format is included in this section. Discussions with your mentor(s) at this stage are encouraged.
- Meet with your supervisor and review your proposed IDP. After considering supervisory input, finalize and sign the IDP. Obtain your supervisor's signature.
- Follow the plan in your IDP and periodically review the document, especially at your mid-term performance review, and make any appropriate adjustments.

CURRENT CAREER ISSUES WORKSHEET

What are your career issues?

How much time and effort you need to spend at any one step in the career planning process depends on your career issues. It is important to be clear about these career issues, so that you can develop an effective strategy for dealing with them. Career issues cover a broad spectrum, ranging from getting up to speed in a new job, to making a major career field change, or planning your retirement.

The following is a list of statements that reflect the full range of career issues people face at one time or another. Which ones are relevant for you now? Place an "X" in front of the statements that are true for you at this time.

- ☐ You are new in your job and must learn the basics to get up to speed and feel comfortable and productive.
- ☐ You have been in your job for a while and are striving for increased competence, in general.
- ☐ You need to improve your performance in certain areas of your current job.
- ☐ You need to update your skills or expertise to keep up with the changing technologies or state-of-the-art knowledge in your line of work.
- ☐ Your job duties have changed recently (or will change), requiring some new skills or expertise on your part.
- ☐ Your job may be eliminated due to reengineering or restructuring, and you want to begin "re-tooling" to be ready for future opportunities.
- ☐ You want to prepare for a promotion or move to the next higher level of responsibility.
- ☐ You want to broaden your skills or expertise to allow yourself more flexibility for future job moves.

You want to change jobs within your current job category, and...

- ☐ Stay at your Center
- ☐ Stay within NASA
- ☐ Stay in the Federal Government
- ☐ Leave the Federal Government

You want to change job categories, and

- ☐ Stay at your Center
- ☐ Stay within NASA
- ☐ Stay in the Federal Government
- ☐ Leave the Federal Government

- ☐ You don't see much of a future if you remain in your current job, but aren't sure of your options.
- ☐ You want to plan your retirement.
- ☐ Other (fill in the blank): _____

KNOWLEDGE OF WORK ENVIRONMENT WORKSHEET

Answer the following questions to identify what is currently going on around me, at my Center, and at NASA, and what changes I expect to occur in the near future:

- How is the mission of my organization (e.g., branch, office, division or lab) changing?

- What other changes are occurring regarding our customers, services/products, work processes, organizational structure, reporting relationships and personnel?

- Is this a change of which I want to be a part or is it time for me to consider a move?

- What are the organization's changing needs regarding the workforce and what new expertise and skills will be required or desirable?

- What opportunities are available for developing this new expertise and skills (work experiences, training, rotational assignments, professional conferences, mentoring, etc.)?

- How might my role (job) change in my organization? How can I prepare for or develop new skills for these changes?

- New expertise and skills my organization wants me to learn include...

- What new missions or projects at my Center or within NASA appeal to me?

- What are the organization's future needs?

- What kinds of development activities would help position me for participation in another work project?

KNOWLEDGE OF SELF WORKSHEET

To gain a better understanding of your self, answer the following questions:

- Of the new and recent developments in my organization or field, what interests me the most?
- What are my current strengths for pursuing these interests?
- What do I need to do to reposition my career so that I can get involved in these new developments?
- Is it time for me to consider working outside of my Center or NASA?
- If I am considering a complete career change, what experiences and learning would help reposition my career in the direction of my new interests?
- Of all the things I have done in the last 5 years (work and non-work related), what specific activities and functions have energized me the most?
- What developmental activities work experiences, learning, skill building--would help me grow in or increase these energizing functions?
- Other things I would like to learn are...
- What non-work related issues do I need to consider that will likely impact my career plans (e.g., health, family, financial, and social)?

INTEGRATION OF KNOWLEDGE OF SELF AND WORK ENVIRONMENT WORKSHEET

To address the match between you and your career goals and organizational needs, answer the following questions:

- In what areas do my interests and personal plans overlap with the changing needs of my organization? [Any areas of overlap represent "first choice" development targets.]

- What knowledge, skills or abilities are important for increasing or maintaining the quality of my performance in my present assignments? (See Appendix C and Appendix D)

- What knowledge, skills or abilities would help prepare me for opportunities or roles I might have in the future? (See Appendix C and Appendix D)

- Compared to the development needs suggested by these factors, other interests for development that are important to me include...

GOAL DEVELOPMENT WORKSHEET

A goal is a statement of a desired outcome or accomplishment that is specific, observable and realistic. Based on the data you have generated about yourself on the previous worksheets and your specific career issues, write some career goals for the next 1, 2 and 3 years and answer the following questions:

- What I want to accomplish and the knowledge/skills I want to acquire or improve by this time next year are…

- What I want to accomplish and the knowledge/skills I want to acquire or improve by the end of the second year are...

- What I want to accomplish and the knowledge/skills I want to acquire or accomplish by the end of the third year are...

- What barriers or obstacles might prevent me from accomplishing my goals on time (e.g., time, money, and other commitments)?

METHOD FOR TAKING ACTION WORKSHEET

To achieve your career goals, identify the actions you plan to take by placing an "X" in front of all applicable actions. In planning your career moves, consider all of the following possibilities.

- ☐ Lateral move: Change in position within or outside an organization, but not necessarily a change in status or pay.
- ☐ Job enrichment: Expand or change my job in order to provide growth experiences for myself.
- ☐ Exploration: Identify other jobs that require skills I have and also tap my interests and values. Job rotation is an example.
- ☐ Downshifting: Take an assignment or job at a lower level of responsibility, rank, and/or salary in order to reposition my career for something new and interesting to me, or to achieve a better balance between work and personal life.
- ☐ Change work setting: No significant change to my job duties, but have a different boss, organization or employer.
- ☐ No change: Do nothing, but only after careful consideration.

There is a wide range of potential actions for me to consider in order to achieve my goals:

- ☐ New assignments in my current job
- ☐ Rotation to a different project/job
- ☐ Seek a mentor(s)
- ☐ Volunteer for a task force or process action/re-engineering team
- ☐ Obtain on-the-job guidance from someone who is more expert in a specific area
- ☐ Attend seminars/conferences (on-site and off-site)
- ☐ Enroll in university courses
- ☐ Attend commercial/contracted courses
- ☐ Experience self-paced learning (books, videos, computer-based instruction, etc.)
- ☐ Pursue an academic degree or certification program
- ☐ Apply for sabbatical leave
- ☐ Conduct informational interviews
- ☐ Move to a new job within my Center
- ☐ Move to a new job within NASA or the Federal Government
- ☐ Move to a new job outside of the Federal Government
- ☐ Start my own business
- ☐ Plan retirement
- ☐ Other actions:

YOUR INDIVIDUAL DEVELOPMENT PLAN

To the extent that any of your career goals involve acquiring some new skills or expertise, an Individual Development Plan (IDP) will be very helpful. The attached IDP form shows one example of an IDP. NASA Centers may have unique IDP forms so check with your Human Resource group to inquire whether or not a specific IDP form exists at your Center. If not, you may use the one shown in this Guide. When beginning your plan, refer back to the goals you formulated on the "Goal Development Worksheet" and the relevant actions from the "Method for Taking Action Worksheet." Dependent on the IDP form used, you may be able to enter this information onto your form. In selecting actions, try to achieve a balance between formal training activities (e.g., courses, seminars) and other kinds of learning experiences (e.g., work assignments, reading books). Also, include realistic time frames for completing your actions.

Your Supervisor's Role

Your supervisor is in an excellent position to support your development by:

- Providing feedback on your performance in your current job and identifying your strengths and areas for improvement
- Acting as a mentor and coach
- Representing the organization's needs, goals and opportunities
- Communicating what is happening around your Center and within NASA
- Helping assess your advancement potential and your qualifications for other positions
- Acting as a resource and referral for exploring your career development options
- Supporting your training and development, providing training opportunities and funding if related to NASA's mission and funds are available
- Mentor(s) can also support your career development. See Appendix H for a discussion of mentors and their role.

EXAMPLE OF A NASA COST ESTIMATOR INDIVIDUAL DEVELOPMENT PLAN*

Name	**Current Position**	**Organization Name/Code**	**Date**
Job Category: ☐ Cost Estimator			
Current Career Stage: ☐ Entry ☐ Journey ☐ Senior ☐ Executive			
Goals **	**Action(s) *****		**Completion Date**
First Year:			
Goals	**Action(s)**		**Completion Date**
Second Year:			
Goals	Action(s)		Completion Date
Third Year:			
Goals	**Action(s)**		**Completion Date**
Longer Term:			

Employee Signature and Date (Optional)

Supervisor Signature and Date (Optional)

* IDP Forms may vary by Center; check with your Human Resource group to see if an IDP form exists for your Center; if so, use the one specific to your Center

** Goals: Identify knowledge/skills and learning objectives. See Appendices C and D for additional information for each job category and career stage.

*** Action(s): Identify training courses and other development activities. See Appendices C and E.

Appendix A: Scope

This guide applies to all employees whose principal job responsibilities include cost estimating. In general, it includes employees who are classified in the following job series:

Series	Title
GS -343	Management and Program Analyst
GS – 801	General Engineer
GS – 861	Aerospace Engineer
GS – 1515	Operations Research Analyst

Additional information regarding position classifications for these job series can be found at the OPM website: http://www.opm.gov/fedclass/gsintro.pdf .

Appendix B: Job Category Definitions

This Cost Estimator Career Development Guide model is based on the cost estimating job categories taken from the CMS dictionary. Listed below is the cost estimating definition as defined from the CMS dictionary:

> **Cost Estimator:** (COSTEST) [121] This competency refers to the knowledge, capabilities, and practices associated with the determination, estimation, and analysis of costs. It encompasses analytical techniques required to develop and assess estimates for hardware/software acquisition; design, integration and test, production, operations and support costs (e.g., life-cycle costs) of programs, projects, systems, and resources. Estimating and cost analysis methodologies used include engineering, parametric, analogy, cost performance analysis, schedule analysis, and statistical risk analysis. Knowledge and skills required include Work Breakdown Structure (WBS) development, data collection, cost estimating relationship development and documentation, application of cost models, and evaluation of cost realism in proposals.

Additional competencies for cost estimators exist. This list represents some of the competencies identified through the NASA CMS system, but it does not represent all the possibilities. Some competencies that have been identified include the following:

> **Program/Project Management:** (PROJPROGMT) [122] This competency refers to the knowledge, capabilities, and practices associated with formulating, planning, implementing, managing, tracking and evaluating work and its associated requirements and risks, ranging from the one-time projects to the program-level work. Critical abilities are to define customer and stakeholder needs and constraints, reduce ambiguity in objectives, develop and manage an efficient project organizational structure, and apply system architecture principles to develop and manage technical requirements in order to achieve the appropriate balance between resources, schedule and technical requirements. Includes knowledge associated with system architecture, finance, budgeting, risk assessment, schedule, configuration management, contract technical management, and project controls.
>
> **Business Management:** (BUSMMT) [113] This competency refers to the knowledge of principles and practices related to managing the internal and external operations of a business unit, such as a Center, to accomplish mission objectives and goals efficiently. Includes ability to integrate performance goals with budget and financial resources as well as the ability to achieve customer satisfaction, develop strong relationships with other NASA and external entities, and adhere to agencywide programs, policies, and procedures. Understanding of Agency and federal government financial, budget and performance operations and processes, and how to apply these processes to optimize operational and investment decisions.

Cost estimating work takes numerous forms. It may involve serving as a cost expert and advisor to management by using analytical and evaluative methods to assess program development or program execution. It may involve efforts to improve organization effectiveness and efficiency. Duties may also require utilization of budgetary and financial management principles and technical and resource loading for long range planning of programs and objectives. This may

include supporting the development and implementation of NASA and Center-level polices processes and procedures consistent with cost estimating efforts.

The scope of this work is to accurately forecast the resource requirements of the program and to accurately judge and justify resource requirement for review by management. The work involves isolating and defining unknown conditions and resolving critical problems. The work product affects the work of other experts, the development of major projects, and the well being of a substantial number of employees.

Cost Estimating and Analysis

Cost Estimating

1. Has general knowledge of hardware, software, and life-cycle cost estimating principles.
2. Has general knowledge of budgeting and cost estimating principles, methods and procedures of complex aerospace programs.
3. Performs in-depth systems cost analysis, cost model development, proposal evaluations, and cost-risk analyses for advanced space-related programs and projects.
4. Identifies parameters that affect cost and analyzes them to develop meaningful cost assessment relationships.
5. Performs cost sensitivity analysis on cost estimates and determines which design parameters most significantly affect the cost.
6. Uses technical expertise to review and validate cost estimates performed by others to ensure completeness, accuracy, and adherence to Center and Agency directives and procedures.
7. Performs independent evaluations and analysis of projects in the areas of cost, schedule, and resource management.
8. Completes comparisons and assessments through mathematical, statistical, economic, and scientific research and analysis.

Cost Risk Analysis

1. Identify cost and schedule risks and recommend measures to mitigate these risks through out the project life cycle.

2. Supports the integration of cost, technical, and schedule risk analyses including resource loading and analysis of ramifications of schedule and technical changes.

Cost Phasing

1. Performs time phasing of cost estimates to determine annual funding requirements based on the technical requirements of the project.

2. Reviews and evaluates highly complex financial and workforce plans to determine spending rates and staff requirements.

Economic Analysis

1. Performs economic or cost-benefit analysis to quantify the cost benefits of alternative solutions for accomplishing an objective in order to find the most efficient solution.
2. Uses or develops economic models to determine net present value, discounted cash flow in evaluation of program or project.

Business Management

Resource Management

1. Has knowledge of the technical, financial, and resource information that predicts controls, and manages resources. This includes all budget data, project scheduling, life cycle cost estimating, and monthly and annual resource planning.
2. Develops complete, integrated program resource plans by means of independent analysis, monitoring and evaluation, of performance, performing trade assessments, and recommending alternative courses of action.

Budget Management

1. Has knowledge of the federal budget process in general, NASA in particular, and associated Agency financial management systems and processes.

Acquisition Management

1. Has knowledge of acquisition strategies, contracting and procurement practices.

Program/Project Management

Project Management

1. Has knowledge of the theory, techniques, and practices of the major R&D aerospace programs and resources management and of how technical programs are developed (including requirements analysis and the operational aspects.)
2. Has knowledge of risk analysis, configuration management, and schedule systems and techniques.
3. Has knowledge of resource planning and control, cost/schedule management trade-off studies, cost/benefit and risk analysis, performance measurement requirement reviews, and trend data analyses.
4. Has knowledge of the use of advanced project management analytical tools and processes for improving costs, life cycle costs, and schedule estimating and analysis capabilities.

Program/Project Planning

1. Prepares, coordinates, and reviews project cost and staffing agreements and statements of work.
2. Evaluates new proposals in terms of resource feasibility and compatibility with the overall project of program.
3. Analyzes the impact of alternative decisions and presents the analysis to managements.
4. Compares programs, schedules, rationale and cost-effectiveness.

Performance Assessment

1. Has knowledge of the quantitative and analytical techniques and technical principles used in analyzing large aerospace programs and projects. This includes mathematical modeling, economic analysis, and engineering techniques.
2. Performs analyses and maintains a monitoring system for project changes to ensure cost and schedule effectiveness and technical success.
3. Assesses the impact of major technical changes or schedule adjustments and proposes reprogramming/rebalancing actions when necessary.
4. Identifies technical and resource issues in specific program and project elements including complex programmatic risks associated with resource requirements that should be addressed by management.
5. Reviews the schedule of hardware deliveries to see of they meet requirements for the present program and/or project.

Science and Engineering

1. Has knowledge of the major operating programs, functions, and objectives of NASA.
2. Has knowledge of space technology, engineering principles, and the general business of space.

Personal and Professional Effectiveness

Communications

1. Must be able to influence, motivate, or direct persons or groups.
2. People contacted may be skeptical or uncooperative and the employee must skillfully approach the individual to obtain the desired outcome.
3. May have contacts with people inside or outside the Agency. These contacts are not routine, the purpose and extent are different, and the role and authority of each party is developed during the contact.
4. Summarize the results, and presents and defends them to project management.
5. Effectively communicates recommendations to management.
6. Converts complex programmatic data into lay terms.
7. Provides on the job training and support to junior and other analysts.

Time Management

1. Prepares short and long range plans to accomplish priorities, define technical milestones and conduct analysis.
2. Plans and carries out assignments, resolves conflicts, coordinates work with others, and interprets policy.
3. Assesses technical requirements necessary to carry out the work.
4. Must be versatile and innovative in adapting, modifying, or making compromises.

5. Uses initiative and resourcefulness in deviating from traditional methods to accomplish the work.

Computer and Information Technology

1. Is proficient in computer software systems such as Microsoft Windows, Microsoft Office, and specialized Agency financial databases.
2. Is proficient in the use of computer tools and databases for cost estimating and analysis.

Appendix C: General Competencies and Associated Training

Overview of General Competencies

The following matrix identifies the general competency training available at the Agency and Center levels. General competencies apply to the performance of all job categories, regardless of specific duties. Therefore, regardless of job position or organizational level, general competencies apply to everyone in the NASA cost estimating community.

NASA has identified the following four broad general competency categories that apply to all members of the NASA cost estimating community as:

- Leadership
- Critical Thinking
- Individual
- Business Relationships

At NASA, "mission success starts with safety." NASA is pursuing a course of action known as the Agency Safety Initiative that specifies NASA will be the Nation's leader in safety and occupational health. Safety and health is NASA's highest priority and most important core value. Consequently, safety must be reflected in all we do. In the context of this Guide, safety is considered an element of each and every general competency.

The table shown below summarizes the four broad general competency categories and their associated knowledge/skills. These general competency categories are listed in random order, while the knowledge/skills within each general competency category are listed in alphabetical order. The outer frame reflects the fact that all competencies encompass safety:

SAFETY			SAFETY
SAFETY	**Leadership** • Coaching • Empowerment • External Awareness • Internal Awareness • Leading and Managing Change • Leading and Managing People and Work • Managing Technology • Mentoring • Negotiating and Influencing • Strategic Thinking, Planning and Evaluating	**Individual** • Adaptability/Flexibility • Communication Skills • Continuous Learning • Insight and Judgment • Integrity and Ethics • Interpersonal Skills, including Advocacy Skills • Self Management • Stress Management • Time Management	SAFETY
	Critical Thinking • Creative Thinking and Innovation • Decision Making • Knowledge Management • Problem Solving and Analytical Thinking	**Business Relationships** • Customer Focus • Partnering and Networking • Teamwork	
SAFETY			SAFETY

To better understand these general competencies, refer to the following definitions:

- **Leadership** consists of the knowledge/skills that encompass an understanding of the organization, the internal and external environment that impacts the organization, and the skills needed to influence, motivate, and challenge others in the workplace.

- **Individual** consists of knowledge/skills that relate to the development and enhancement of personal business habits needed to communicate effectively and honestly, manage time and stress, and attract others to well reasoned and logical points of view.

- **Critical Thinking** consists of the knowledge/skills required by employees to gather data, analyze problems, evaluate options, and develop/implement creative solutions to organizational challenges.

- **Business Relationships** consists of the knowledge/skills needed to effectively collaborate, internally and externally, with customers, partners, and team members in the business environment.

LEADERSHIP

Coaching: Clearly communicates performance expectations to peers and employees; openly shares information for the benefit of the organization; models and communicates the values, behaviors, and work practices expected of the workforce; provides constructive feedback

Empowerment: Creates and sustains an organizational culture which encourages others to provide the quality of service essential to high performance; enables others to acquire resources and tools, including the responsibility and authority for work accomplishment

External Awareness: Identifies external environment, e.g., political, economic, social, that impact the work of the organization; understands and responds to internal and external strategy, policies, and regulations that impact NASA; approaches each problem situation with a clear perception of organizational and political reality; recognizes the impact of alternative courses of action

Internal Awareness: Knows the organization's vision, mission, and culture and how its social, and political systems work; operates effectively within these systems to maximize their benefit to the organization; understands and leverages the impact of unwritten organizational rules; understands NASA and Center organizational structure, strategic goals, and management approach

Leading and Managing Change: Takes a long-term view, acts as a catalyst for, and contributes to organizational change; actively leads and manages change, while integrating key stakeholder, customer, and organizational goals and values; balances the requirements of change and continuity, while continually improving all aspects of product and service delivery, within the basic organizational framework; maintains focus, intensity, and persistence in an environment of competing interests; identifies and mitigates risks associated with change; removes obstacles that create resistance to change

Leading and Managing People and Work: Maximizes NASA's human capital and people's commitment to achieving organizational goals; sets performance expectations; works with team members to establish mutually acceptable requirements, performance objectives, and milestones; evaluates work performance and provides feedback to others on their performance; ensures that staff are appropriately selected, utilized, developed, appraised, and are treated in a fair, equitable, and respectful manner; provides rewards and recognition to the team and individuals; removes obstacles to team and individual performance; takes appropriate corrective action, when required

Managing Technology: Comprehends relevant technologies available at NASA and their potential for organizing and managing workflow, including leading virtual teams; selects and uses those appropriate for managing work; knows and uses technology policies effectively (NF-1767-ITAR); uses technology to improve own performance

Mentoring: Counsels others, through formal or informal methods; willingly serves as a role model; shares organization insights and lessons learned; provides sound advice on career development goals, strategies, and options

Negotiating and Influencing: Persuades others to accept recommendations and exchange information or change their behavior in order to accomplish common goals; works with others toward an agreement; builds consensus to achieve mutually acceptable solutions, facilitating the discussion of sensitive issues; manages and successfully resolves conflicts and disagreements through give and take; promotes an atmosphere where mistakes can be discussed openly

Strategic Thinking, Planning and Evaluating: Takes a long-term view, acts as a catalyst for, and contributes to organizational change; builds a shared vision with others; influences others to translate vision into action; identifies and implements appropriate metrics to measure progress

INDIVIDUAL

Adaptability/Flexibility: Open to change and new information; adapts behavior and work methods in response to new information, changing conditions, or unexpected obstacles; adjusts rapidly to new situations warranting attention and resolution; champions new ideas and methods, despite opposition, when the organizational benefits outweigh the costs

Communication Skills: Expresses information, in writing and orally, in a succinct and organized manner that is appropriate for the intended audience; effectively listens to others, seeks understanding, and clarifies information as needed; ensures that people are clear about the information communicated; correctly and accurately uses the English language (i.e., grammar, spelling, punctuation, syntax)

Continuous Learning: Grasps the essence of new information; masters new technical and business knowledge; recognizes own strengths and weaknesses; pursues self-development; seeks feedback from others, including unsolicited feedback; seeks opportunities to master new knowledge

Insight and Judgment: Uses common sense; maintains confidentiality; uses the culture and politics of the organization effectively

Integrity and Ethics: Acts according to the highest ethical standards; demonstrates consistency among actions and words; takes responsibility for actions; admits a mistake when one is made; understands the impact of violating these standards on the organization, self, and others

Interpersonal Skills: Considers and responds appropriately to the needs, feelings and capabilities of different people in different situations; is tactful, compassionate and sensitive, and treats others with respect; relates well to people from varied backgrounds, cultures, and international business environment; is sensitive to cultural diversity, race, gender, disabilities, and other individual differences

Self-Management: Sets well-defined and realistic personal goals; displays a high level of initiative, effort, and commitment toward completing assignments in a timely manner; demonstrates a passion to perform work; performs with minimal supervision; is motivated to achieve, despite obstacles; demonstrates responsible behavior

Stress Management: Deals calmly and effectively with high-stress situations, such as tight deadlines, hostile individuals, and emergency and dangerous situations; balances job and personal pressures, making considered and well informed decisions regarding work, family, and self

Time Management: Uses time in the most effective and productive way, and properly assess and utilizes priorities in time allocation; controls distractions that waste time and break work flow

CRITICAL THINKING

Creative Thinking and Innovation: Uses imagination to develop new solutions to problems; designs new methods where established methods and procedures are ineffective or nonexistent; encourages creative thinking and innovation; experiments with new ideas and approaches

Decision Making: Makes sound, well informed, and timely decisions; perceives the impact and implications of these decisions; commits to action, even in uncertain situations, that support accomplishment of organizational goals

Knowledge Management: Identifies a need for and knows how to gather information; organizes and maintains information in a logical fashion; applies appropriate information to organizational challenges; captures, stores, and shares information, knowledge, best practices and lessons learned

Problem Solving and Analytical Thinking: Identifies problems; determines accuracy and relevancy of information; uses sound judgment to generate and evaluate alternatives; makes timely recommendations; clarifies issues; keeps focused on the things that are most important

BUSINESS RELATIONSHIPS

Customer Focus: Works with clients, customers, and partners to accurately assess their needs and wants; matches team capabilities to customer needs; provides information and assistance, resolves customer problems; evaluates service and acts to ensures customer satisfaction

Partnering and Networking: Identifies common goals and objectives with new and prospective partners; pursues mutually beneficial and cooperative activities; develops networks and builds alliances; engages in cross-functional activities; facilitates "win-win" situations; establishes and uses informal networks to obtain resources and information

Teamwork: Encourages and facilitates cooperation, pride, trust, and group identity; fosters commitment and team spirit; works effectively with others to achieve goals; facilitates an open exchange of ideas; fosters an atmosphere of open communication

Technical Competencies

Technical competencies correlate to the functional expertise required for one's job category. This Guide provides a comprehensive list of technical competencies for the cost estimator job category in Appendix D. A competency is a generalized subject/performance area that an employee must be capable of performing adequately at the appropriate stage of his/her career. Each competency consists of knowledge and multiple skills and is measured by the achievement of learning objectives. Learning objectives reflect the expected level of performance required to be competent.

Individuals do not need to master all competencies at the entry level in order to progress to the journey level. Employees and supervisors should identify those competencies that are pertinent for the employee's current job assignment and chosen career path. Whether one has achieved a level of mastery should be jointly determined by the employee and his/her supervisor and appropriately reflected in the employee's IDP.

As one's career advances from entry through journey, and perhaps through senior and executive career stages, the expected level of technical competency increases. Additionally, employees are expected to achieve cross-functional competency as their level of job responsibility increases. For example, individuals at the journey level are expected to have mastered all pertinent technical competencies at the entry level. In turn, employees at the senior level are expected to have mastered all the pertinent technical competencies at both the entry and journey levels. In addition to mastering pertinent technical competencies at the entry, journey, senior, and executive levels, individuals at the executive level must also possess the executive core qualifications published by the U.S. Office of Personnel Management. These core qualifications, and their underlying competencies, are published in the Guide to Senior Executive Service Qualifications, available on the Internet at: http://www.opm.gov/ses/handbook.asp

Developmental Experiences

The following matrix displays a sampling of the current developmental programs available to individuals working in the cost estimating community at NASA. Each program's length (duration), schedule, minimum eligibility requirements (career stage, target grade level, and job category), estimated cost, description, and web address(es) for additional program information are displayed. Courses may change in time a well as course offerings so check the Center training web pages, SATERN and the NASA Training and Development program for up to date information.

The programs are categorized as follows:

- Fellows programs and other programs offered by independent organizations
- NASA-wide programs
- NASA Center-specific programs
- Programs sponsored by other government agencies
- University- sponsored programs

Most programs primarily address the general competency categories (leadership, critical thinking, individual, and business relationships) discussed in Section 6. However, many of the programs can be tailored to address the specific needs of the participant. The majority of the non-university programs provide a mixture of formal classroom training, briefings, and on-the-job developmental assignments.

Current Developmental Programs Available for Cost Estimator Employees

Program	Length	Program Schedule	Eligibility		Estimated Cost
			Career Stage Grade Level	Job Cat.	
Council for Excellence in Government (EIG) Sponsored:					
EIG Fellows Program	1 yr.	Sept - Sept	Senior/ Executive with Masters 14 – 15 (Exceptional 13s)	CE	Tuition: $9400 plus travel
	http://www.excelgov.org/displaycontent.asp Intensive leadership program designed to build the capacity of mid-level federal managers to lead organizations and produce results; while continuing in their current jobs, Fellows participate in a year-long series of activities (monthly meetings, workshops, benchmarking site visits to corporations and government organizations, seminars, and team meetings).				
Federal Executive Institute (FEI) Sponsored:					
Leadership for a Democratic Society Program	4 wks.	Offered throughout year	Executive SES and high 15	CE	Tuition: Standard-$10,950 plus travel & Appl. Learning $11,450 plus travel
	http://www.leadership.opm.gov/programs/Executive-Leadership-Development/LDS/Index.aspx At FEI in Charlottesville, VA, the program help participants build a healthier working culture by exchanging ideas on improving program performance and addressing areas of interagency cooperation and conflict with colleagues from other departments.				
Government Affairs Institute (GAI) at Georgetown University:					
Capital Hill Fellows Program	12 or 7 mos.	Jan - Jan (with Dec. orientation)	Senior/ Executive 13 and above	CE	Training: $4000 for 7-month program; $5400 for 12-month program plus travel $
	http://www3.georgetown.edu/programs/gai/programscourses/program/fellowship.html Program provides executive branch employees the opportunity to serve full-time in assignments with the Congress, gaining a hands-on understanding of how the Legislative Branch works and how decisions affecting federal agencies programs are made; consists of GAI training and developmental assignments while carrying out the duties of a congressional personal staffer or committee staffer.				
Certificate Program in Legislative Studies	18 mos.	Dependent on participant and courses selected	Senior/ Executive 12 and above	CE	$25 application fee, plus 5 courses at approx. $600-1,200 per class plus travel
	http://www3.georgetown.edu/grad/gppi/gai/programscourses/program/certificate.html Program's focus is on the congressional process, organization, and practices, and on the relationship between Congress and the other branches of the federal government; mix of classroom courses (min. 5) and actual time spent on Capital Hill interfacing with actual players.				
NASA HQ-Sponsored: (for use Agency-wide)					
NASA Fellowship Program	Variable	variable	Full time permanent who has not received long-term fellowship within 5 years and short-term fellowship within 3 years	CE	variable
	http://fellowship.nasa.gov/ The NASA Fellowship Program provides high potential employees with the opportunity to attend world-class academic programs as a means of enhancing their management and leadership capabilities. These programs provide an excellent opportunity for participants to study and work with individuals Government wide, nationally with industry participants, and globally with international students.				
NASA Administrator Fellowship Program					
	http://www.uncfsp.org/divstNAFPinst.aspx This program is designed to enhance the professional development of NASA employees and the Science, Technology, Engineering, and Mathematics (STEM) faculty of Historically Black Colleges and Universities (HBCUs) and Other Minority Universities. The program also seeks to increase the ability of these Minority Universities to respond to NASA's overall research and development mission. Six fellowships are awarded each year.				

Program	Length	Program Schedule	Eligibility		Estimated Cost
			Career Stage Grade Level	Job Cat.	
SES Candidate Development Program (SESCDP)	12 to 18 mos.	Usually 1 year; offered every 2 years	Executive 14 – 15	CE	Training costs dependent on participant's needs; plus travel $
	http://nasapeople.nasa.gov/training/devprogs/sescdp.htm Provides a series of developmental experiences for individuals who have high potential for assuming executive responsibilities; mix of formal courses/seminars, developmental work assignments, and individual mentoring from current SES members.				
NASA Leadership Development Program		variable	GS 13-15	CE	Variable
	http://ldp.nasa.gov/ As part of an integrated Strategic Human Capital Plan, the LDP is a succession-planning tool aimed at ensuring that NASA has the leaders it needs for the future. The LDP is intended to prepare leaders to take on higher and broader roles and responsibilities in the near future.				
NASA Center-Specific:					
(1) Ames Research Center					
Academic Programs - Undergraduate Level	Depends on participant	Depends on participant and specific degree program	All Levels	CE	Tuition Costs dependent on College/university attending
	http://ameshr.arc.nasa.gov/training/academic/Academic.html Undergraduate program leading to degrees at various area community colleges/universities.				
Academic Program - Graduate Level	Depends on participant	Depends on participant and specific degree program	All Levels	CE	Tuition costs dependent on college/ university attending
	http://ameshr.arc.nasa.gov/training/academic/Academic.html Program enables employees to attend graduate school on a part-time basis; principle purpose is to improve skills and knowledge in ways that benefit Ames and courses must be consistent with this; participants are generally limited to 2 courses per semester/quarter.				
Full Time Graduate Study	1 year	Dependsonparticipant	All Levels	CE	Tuition costs dependent on college/ university attending
	http://ameshr.arc.nasa.gov/training/academic/Academic.html Program allows high potential technical or administrative professionals an educational opportunity to enhance their professional development of NASA Ames employees by attending a graduate school on a full time basis. The principle purpose is to improve skills and knowledge in ways that are strategically aligned with NASA Agency and Ames missions.				
(2) Dryden Research Center					
Continuing Education Program	Varies	Sept- August	All Levels	CE	$600/course or $4800
Graduate Studies Program	Varies	Sept- June	All Levels; Competitive	CE	$2000/course or $16,000
(3) Glenn Research Center					
Cleveland Federal Community Leadership Institute	9 months	Oct – June	GS 9-13	CE	$750
	http://www.grc.nasa.gov/WWW/ODT/devprog.htm (Internal NASA only) To assist Federal agencies in the professional development of leaders and to understand and develop community partnerships.				
Development Programs	varies	varies	TS	CE	varies
	http://www.grc.nasa.gov/WWW/ODT/devprog.htm				
Full-Time Graduate Study Program	Varies	Varies Feb-April application	7 and above	CE	Tuition costs dependent on university attending
	http://www.grc.nasa.gov/WWW/ODT/links.htm Program allows select employees to attend graduate school on a full time basis for a limited number of Ph.D. and exceptional Master's candidates each year; individuals approved for full-time study can either participate in part-time courses while working, or request attendance at school without working for the residence portion of their program; proposed programs of full-time study should relate directly to the work the individual is responsible for and the proposed research/work should contribute significantly to Glenn's programs/mission.				
MBA Graduate Study Program	2 yr.	Sept-June	7 and above	CE	Tuition costs dependent on university attending
	http://www.grc.nasa.gov/WWW/ODT/announce.htm (Internal NASA only) Program consists of business courses offered on-site by Cleveland State University; program's purpose is to provide an opportunity for employees with a job/mission related need that supports agency goals, to develop knowledge, abilities, attitudes, and understanding that will constitute a foundation for their growth into competent and responsible business administrators; program is targeted for employees who are in Professional Administrative, Scientist and Engineer, or Supervisory positions, who have graduate standing with an accredited university.				
New Leader Program	6 mos.	Jan – July; May - Nov	Journey 7-11	CE	Training: $1995
	http://www.grc.nasa.gov/WWW/ODT/announce.htm(Internal NASA only) http://grad.usda.gov/course_details.php?cid=NLED7300L Program is designed to prepare future leaders by developing skills necessary for federal workers to be effective in a rapidly changing federal environment; mix of classroom and developmental assignments.				

Program	Length	Program Schedule	Eligibility		Estimated Cost
			Career Stage Grade Level	Job Cat.	
On-Site Graduate Education Program	2 yrs.	Sept - June	7 and above	CE	Training costs dependent on participant's needs
	http://www.grc.nasa.gov/WWW/ODT/HRP/PHDMemo01.pdf Program offers individuals an opportunity to complete Master's and Doctoral level Engineering coursework provided by five Ohio universities; courses are provided both through live and televised instruction; principle purpose is to improve skills and knowledge in ways that benefit Glenn and courses must be consistent with this.				
Part-Time Graduate Study Program	2 yrs.	Sept - June	7 and above	CE	Training costs dependent on participant's needs
	http://www.grc.nasa.gov/WWW/ODT/HRP/PHDMemo01.pdf Program enables employees to attend graduate school on a part-time basis; principle purpose is to improve skills and knowledge in ways that benefit Glenn and courses must be consistent with this; participants are limited to two courses per semester/quarter.				
Part-Time Undergraduate Study Program	Varies	Offered throughout year	7 and above	CE	Training costs dependent on participant's needs
	http://www.grc.nasa.gov/WWW/ODT/HRP/PHDMemo01.pdf Program enables one to attend undergraduate school on a part-time basis leading to degrees at various area community colleges/ universities; certificate programs are also available at college/univ. extensions; also sponsors on-site business courses through Cuyahoga Community College and Baldwin Wallace University; the purpose of the undergraduate series is to assist employees in preparing for the Certified Professional Secretary (CPS) Examination, and to further the education of those with CPS rating; it is also open to employees in the STEP, GO, and CEP Upward Mobility Programs and other employees with job related needs.				
Women's Executive Leadership Program	1 yr.	Sept - June	Journey/ Senior 11 – 12	CE	Training: $3650
	http://www.grc.nasa.gov/WWW/DT/HRP/fellowshipdesc.htm#welp Program develops high potential women for a career in management and leadership positions; is tailored to one's specific developmental needs with emphasis on the Leadership Effectiveness Framework.				
(4) Goddard Space Flight Center					
Leadership Alchemy Program	9 months	Once a calendar year	Journey/Senior 12 - 15	CE	Tuition: Approximately $10K plus travel to Greenbelt, MD for non-Goddard personnel. Center-funded for Goddard personnel.
	http://ohcm.gsfc.nasa.gov/DevGuide/DevPrograms/Alchemy/home.htm A state-of-the-art, award-winning program designed by NASA GSFC with up to 4 slots available for other NASA Centers. The program focuses on leadership development from the inside-out and emphasizes the practices of action learning, appreciative inquiry, emotional intelligence, developing the presence of a leader, and reading and reflection.				
Part-Time Graduate Study Program	Depends on participant	Depends on participant's program	All levels	CE	Tuition cost dependent on university attending
	http://ohcm.gsfc.nasa.gov/DevGuide/DevPrograms/part.htm Program allows limited number of Goddard employees to pursue advanced academic study; participants may attend training up to 16 hours during workweek.				
Study Fellowship Program (SFP)	max12 monthswith1-yearoptionto extend	Dependsonparticipant's program	GS11 and abovewith min.1 year asfull time employee	CE	Center funded; varies depending on institution/ research facility; max. $5,000 travel cost
	http://ohcm.gsfc.nasa.gov/DevGuide/DevPrograms/SFP-FY08-AcademicCall.doc Goddard's RFP provides an opportunity for employees to broaden their knowledge through interaction with peers at academic institutions or research facilities. Employees who are selected may pursue independent or cooperative research at domestic or foreign accredited educational institutions or appropriate research facilities.				
Undergraduate Study (US) Program	Maximum 2-year participation	annual call	full time permanent or term employee with min. 1 year experience and GPA requirement	CE	Tuition, fees, and textbooks covered; costs dependent on university attending
	http://ohcm.gsfc.nasa.gov/devguide/devprograms/usp/fy07uspapp.doc The US program is designed to encourage continual learning by facilitating part-time study at the undergraduate level. With supervisory approval, participants may be released for up to 16 hours per week (4 hours per 3 or 4 credit course taken) from scheduled work, with pay, to attend and prepare for classes.				
(5) NASA Headquarters					
Continuing Education Program (CEP)	Depends on participant	Admission to program annually	Non-professionals up to GS-11	CE	Tuition cost dependent on university attending
	http://ohcm.gsfc.nasa.gov/DevGuide/DevPrograms/ hqacademic_cep.htm Program designed to provide employees with the opportunity to obtain the education needed to enhance their career potential; attend college courses related to specific career goals.				
Graduate Study Program (GSP)	Depends on participant	Admission to program annually - June deadline	All levels	CE	Tuition, fees, and portion of textbooks covered; depending on university attending
	http://ohcm.gsfc.nasa.gov/DevGuide/DevPrograms/gsp.htm Program enables employees to pursue job-related graduate study while still performing their work functions.				

Program	Length	Program Schedule	Eligibility		Estimated Cost
			Career Stage Grade Level	Job Cat.	
(6) Johnson Space Center					
JSC Fellowship Program (Graduate Study)	1 year	Depends on participant; January application date	All levels; must have minimum 3 yrs. JSC service	CE	Tuition & related fees covered; travel $ not covered
	http://nasapeople.nasa.gov/Training/default.htm(INTERNAL NASA ONLY) Program allows one to attend graduate school on a leave-with-pay basis for 1 continuous year; participants chosen through a competitive Center process.				
Part-Time Graduate Study	Depends on participant	Depends on participant	All levels	CE	Tuition costs; 6 credit hour maximum per semester
	http://nasapeople.nasa.gov/Training/default.htm (INTERNAL NASA ONLY) Provides tuition assistance for academic coursework that is job and/or mission-related; usually after hours; time away from work will be made up unless course is a job requirement.				
Project Increased Qualifications Program (Project IQ)	2 yearsduringregularduty hrs.	Dependsonparticipant; February application date	Entry & journey;must haveminimum 1 yrJSC service	CE	Tuition & related fees covered
	http://nasapeople.nasa.gov/Training/default.htm (INTERNAL NASA ONLY) Program allows one to attend undergraduate academic courses during duty hours; is designed to strengthen one's qualifications for a position with higher promotion potential or to upgrade abilities for one's current position; must have completed at least 6 hrs. college work and does not possess a bachelor's degree.				
(7) Kennedy Space Center					
Kennedy Graduate Fellowship Program (KGFP)	Depends on participant	Starts in fall annually	All levels	CE	Tuition, fees, and textbooks covered
	http://ba.ksc.nasa.gov/tdindex.htm Program provides participation in full- and part-time doctoral programs and full-time master's program; approved participants may attend on a full-time basis up to 1 calendar year.				
Kennedy Undergraduate Studies Program (KUSP)	Depends on participant	Starts in fall annually	All levels	CE	Tuition, fees, and textbooks covered
	http://ba.ksc.nasa.gov/tdindex.htm Program provides an internal source of qualified candidates in shortage category occupations requiring an academic degree; restricted to AST and professional administrative degree; may allow participants up to 4 hours duty time per week for training.				
(8) Langley Research Center					
Executive MBA (EMBA) Program – College of William and Mary	2 years part-time	Starts in fall annually; May/June Call Letter	All levels	CE	Tuition, fees, and textbooks covered
	http://ohr.larc.nasa.gov/training/ Program designed to provide participants an MBA over a 2-year period; attend classes on a part-time basis during workweek and on weekends.				
Full-Time Graduate Study-Advanced Study Program	Depends on participant	Depends on participant; Nov/Dec Call Letter	All levels	CE	Tuition and textbooks covered
	http://ohr.larc.nasa.gov/training/ Program designed to provide additional graduate level study directly related to Langley work performed by program participant; full-time graduate-level courses taken.				
Part-Time Graduate Program-Advanced Study Program	Depends on participant	Depends on participant; Call Letter at start of semester	All levels	CE	Tuition costs dependent on university attending
	http://ohr.larc.nasa.gov/training/ Program designed to assist college graduates in becoming more productive via part-time graduate-level study.				
Part-Time Undergraduate Program	Dependsonparticipant	Dependsonparticipant	Dependsonparticipant	CE	Tuition costs dependent on university attending
	http://ohr.larc.nasa.gov/training/ Program designed to assist employees who are obtaining additional job-related training in order to develop themselves for their current position.				
Professional Development Program (PDP)---Level III	Depends on participant	Depends on participant	Depends on participant	CE	Training costs dependent on participant's needs; plus travel
	Provides a developmental work assignment within another Langley organization at or outside NASA; assignment provides experimental learning in new tasks/functions; is supplemented by seminars and formal classroom education tailored to the individual needs.				
(9) Marshall Space Flight Center					
A&M Executive Development Program	Two separate modules, each is 40 hours	Module I – January Module II – May	GS 11-13	CE	Approximately $1,100 per participant
	Program designed to increase employees awareness of management/leadership strategies and practices; participation in Module I is not a prerequisite for participation in Module II.				
Professional Intern Program (PIP)	Depends on grade level at program entry	According to time of program entry	Entry-Journey	CE	Salary of participants
	http://ohc.msfc.nasa.gov/old/ Program provides a systematic plan for the development and advancement of interns; designed to provide background knowledge in several job specialties and specific knowledge in one specialty; thereby decreasing the time required for interns to achieve full job effectiveness.				

Program	Length	Program Schedule	Eligibility		Estimated Cost
			Career Stage Grade Level	Job Cat.	
Full-Time Study Program	1 yr. usually	Aug - Aug	All levels	CE	Tuition dependent on university attending
	http://ohc.msfc.nasa.gov/old/ Program designed to provide additional graduate level study in participant's field of choice; full-time study at a college/ university; provides opportunity to concentrate on academic training in order to enhance one's current and future work performance and efficiency.				
Part-Time Graduate Study	Depends on participant	Depends on participant	All levels	CE	Tuition dependent on university attending
	http://ohc.msfc.nasa.gov/old/ Program designed to assist employees in obtaining additional, job-related training via a university graduate-level course of study.				
Part-Time Undergraduate Study	Depends on participant	Depends on participant	All levels	CE	Tuition dependent on university attending
	http://ohc.msfc.nasa.gov/old/ Program designed to assist employees in obtaining additional, job-related training via a university graduate-level course of study.				
(10) Stennis Space Center					
Continuing Education Program	Varies	Aug - July	Entry-Journey	CE	Averages $750 per semester
	http://www6.ssc.nasa.gov/hr/training.html (Internal NASA only) NASA/SSC Training and Development Plan LA00-CWI-002; Program participants may take up to 2 classes per semester.				

Appendix D: Technical Competencies for Cost Estimators

This appendix provides a proposed list of technical competencies for cost estimators. The set of skills required to perform cost estimation is large and varied. The successful cost expert must not only know the "ins" and "outs" of the trade, but must also be well versed in everything from aerospace design and manufacturing methods to the government budget process.

The technical competencies are organized from the general to the specific by career stage (entry, journey, senior, executive). There is no prioritization intended. Each competency consists of multiple knowledges and skills and is measured by the achievement of learning objectives. Learning objectives reflect the expected level of performance required to be competent.

The technical competencies are cumulative. For example, individuals at the journey level are expected to master all pertinent knowledge/skills at the entry level. Similarly, individuals at the senior level are expected to master all pertinent knowledge/skills at the entry and journey levels.

Employees should identify the knowledge/skills they possess and can demonstrate through achievement of related learning objectives. At the same time, they should use these tables to identify the pertinent knowledge/skills required for effective performance of their job and then the available training that can be used to achieve these knowledge/skills.

Entry Level

Competency	Knowledge/Skills	Learning Objective
1. Cost Estimating and Analysis	Fundamentals of systems acquisition management	Fundamental precepts and bases of systems acquisition management
		The diverse, interrelated, and changing nature in the different disciplines of systems acquisition management
		The regulations and governing structures of systems acquisition management
	Fundamentals of cost analysis	Define cost data and apply appropriate quantitative techniques to estimate costs for major acquisition programs
		Explain cost estimating policies
		Understand the elements of a life-cycle cost analysis
	Fundamentals of Earned Value Management	Describe how EVM is used to plan and integrate cost, schedule, and technical program aspects and assess progress
		Correlate contractors' management systems characteristics to the Guidelines in the EVM Systems Industry Standard EIA-748
		Recommend alternative EVM applications based on project risks
		Explain the IBR process
		Develop EACs based on project cost, schedule and technical data
		Identify relevant acquisition organizations, key players and formal agreements

Competency	Knowledge / Skills	Learning Objective
	Fundamentals of business financial management	Describe the overall resource allocation process and identify the terminology and concepts used in analyzing the costs of acquisition programs
		Explain the appropriations, policies, and practices applicable to developing a program budget
		Examine the Planning, Programming and Budgeting System (PPBS) and the impact of programming and budgeting decisions on acquisition programs
		Summarize the Congressional enactment process and the impact of Congressional actions of acquisition programs
		Identify the processes by which budget authority is apportioned, executed in accordance with public law, and reprogrammed
2. Business Management	Knowledge of budget, cost accounting, cost/schedule management and program terminology, concepts, policies, and principles	Demonstrate basic knowledge of budget, cost accounting, cost/schedule management and program terminology, concepts and principles
		Describe applicable Agency, legislative, administrative, and regulatory requirements
		Research questions concerning application of generally accepted budgeting principles
3. Program/ Project Management and Control	Foundations of Project Management	Basic Project Management Concepts
		The Life Cycle Management Approach
		Project Planning
		Scheduling and Control Basics
		NASA Program/Project Cost Estimating Techniques
		NASA Program/Project Budgeting and Interaction with the Federal Budgeting Process
		Project Data, Information and Configuration Management Processes
		Contract Engineering and the Procurement Process
		Contract and Project Baseline Management
		Earned Value Management
4. Science and Engineering	Understanding Space	Basic knowledge and a “big picture” perspective about space technology, engineering and the business of space.
5. Personal and Professional Effectiveness, Leadership, and Supervisory	Time & Stress Management	Basic knowledge of time management to improve performance and reduce stress
		Minimize crisis by encouraging proper planning
		Organize and access critical information associated with your planning tool
		Focus on high-leverage activities that will increase return on investment
		Create a healthy balance between personal and professional development
		Share a common vision and mission that creates unity among team members
	Communication Skills	Basic knowledge of effective writing skills
		Basic knowledge of effective speaking and oral presentation skills

Competency	Knowledge / Skills	Learning Objective
6. Computer and Information Technology	Basic office applications: operating system, web browsing, email, word processing, spreadsheet, presentation graphics	Basic knowledge and ability to use personal computer software including operating system, email, web browser, word processing, spreadsheet and presentation applications.
	Hardware cost models	Basic knowledge of NAFCOM, PRICE H, and SEER H

Journey Level

Competency	Knowledge / Skills	Learning Objective
1. Cost Estimating and Analysis	Intermediate systems acquisition management	Enhance and apply knowledge of the business, technical, and managerial aspects of acquisition
		Understand and appreciate the critical role that each functional discipline plays in the acquisition process
		Effectively participate in integrated product teams to develop plans and resolve problems
	Intermediate cost analysis	Understand the cost estimating process
		Normalize data for content, quantity, and economic year
		Develop cost estimates using various techniques
		Document cost models and estimates
		Apply time-phasing techniques in development, production and operation and support phases of the life cycle, including cost improvement curves
		Understand and perform sensitivity and risk analysis of an estimate
	Intermediate earned value management	Synthesize the relationship between EVM and acquisition management
		Prepare EVM requirements for the RFP
		Evaluate a contractor's management systems against the 32 EVM Guidelines
		Synthesize the planning, organization, execution, and follow-up of an integrated baseline review
		Identify working relationships of stakeholders
		Use EVM techniques and automated tools to analyze information from the Cost Performance Report and critical path scheduling tools to assess and report a contractor's cost and schedule performance
	Contractor finance	Recognize and analyze financial and business issues
		Use the vocabulary and concepts necessary to discuss these issues with the contractor community
2. Business Management and Program Control	Knowledge of budget, cost accounting, cost/ schedule management and program terminology, concepts, policies, and principles	Prepare, justify, and defend budget exhibits and obligation/expenditure plans
		Formulate impact/reclama statements and reports
		develop and defend business aspect of the acquisition cycle
3. Program/Project Management and Control	Project Management	Possess a basic understanding of project management and related issues
		Critical Tools and Techniques Used in the Technical Management of Projects

Competency	Knowledge / Skills	Learning Objective
		Tools and Techniques for the Effective Management of Teams and Project Members
		Future Trends of Project Management from the Perspective of Both Internal and External Leaders in the Project Management Business and Allied Fields
		Best Practices Emerging from NASA Research and Experience Papers
		Other Institutional Approaches to Managing Projects and Establishing Critical Networks for Future Success
	Systems Management	Describe the project system engineering process
		Direct the project requirements development process
		Manage the system architecture development including concept tradeoffs
		Direct integration of system components and verify that requirements have been met
		Manage system documentation, data configuration management and flow
4. Science and Engineering	Fundamentals of Orbital and Launch Mechanics	Familiarity with the principles, major tools, and analysis techniques necessary to make the design choices and operational decisions required for overall space flight mission success
	Space Mission Analysis and Design	An integrated view of space mission design and operations, from mission objectives and requirements definition, through spacecraft design, development and test, to creating mission operations concepts and ground infrastructure capabilities
5. Personal and Professional Effectiveness, Leadership, and Supervisory	Situational Leadership	Develop a shared understanding and common vocabulary necessary for effective leadership
		Gain insight into effective leadership skills
	Influencing Others	Learn to use the Situational Leadership model Guidelines to influence the behavior of others in various situations
		Learn to deal more effectively with conflict situations to achieve positive outcomes
		Learn to interact effectively in group situations
		Learn how to capitalize on the strengths of your communication and behavioral type (Myers-Briggs) in order to interact more effectively with others
		Learn how to identify and understand the levels of listening
		Learn to use more effective listening techniques
	Crossroads	Examine the utility and impact of different management styles and practices
		Assess your interpersonal and leadership skills through questionnaire feedback from co-workers
		Identify specific opportunities for increasing your effectiveness back at work
		Evaluate your interest in and desire for supervisory positions
	Crossing Department Lines	Understand his/her primary influence style and use alternative methods of influencing others

Competency	Knowledge/Skills	Learning Objective
		Identify techniques and steps to strengthen working relationships
		Increase effectiveness in resolving conflicts
		Contribute to building a collaborative working environment
	Assessing Your Leadership Skills	Identify and assess your personal leadership strengths and limitations through a variety of assessment instruments
		Gain greater self-awareness and insight into your work behavior patterns, interpersonal skills, and personality traits.
6. Computer and Information Technology	Advanced office applications: project management, database, website development tools	Basic knowledge and ability to use advanced office application software including project management, database and web site development tools.
	Software cost models	Basic knowledge and ability to use parametric software cost models, including: COCOMO, PRICE S, and SEER SEM

Senior Level

Competency	Knowledge/Skills	Learning Objective
1. Cost Estimating and Analysis	Software Cost Estimating	Describe the software acquisition process
		Determine an appropriate cost estimating method and the types of data required for a software estimate
		use models for software life cycle cost estimating
		Compare and contrast alternative techniques for software cost estimating
		Apply software cost estimating techniques
		Discuss the strengths and weaknesses of software cost estimating models
		Discuss major influences on software cost estimating
	Operating & Support Cost Analysis	Recognize the full spectrum of costs included in O&S cost estimates
		Plan and perform an O&S cost estimate
		Obtain and normalize O&S data
		Apply appropriate cost estimating methods and models
		Document cost models and cost estimates
		Apply economic analysis tools to evaluate alternative courses of action
	Cost Risk Analysis	Assess subjective probabilities to represent uncertain cost elements in an acquisition program
		Model the cost risk associated with a program
		Judge the reasonableness of a cost risk analysis
	Economic Analysis	Determine the most cost-effective way of conducting NASA business
		Determine the alternative that will warrant the highest benefits
		Estimate the cost of competing alternatives

Competency	Knowledge / Skills	Learning Objective
		Assess the uncertainty that may exist, using sensitivity analysis and prior estimates of benefits and cost of competing alternatives
		Provide a rationale for conclusions
2. Business Management	Business, Cost Estimating & Financial Management Workshop	Explain the tasks and duties of BCEFM functions
		Define current BCEFM-related laws, re-calculations, policies and procedures
		Evaluate the interrelationships among the BCEFM functions
		Point out the appropriate decision-making information based on the integrated nature of a BCEFM task
3. Program/Project Management and Control	Advanced Project Management	Selection and Application of the Appropriate Tools of Life Cycle Management
		Tailoring the Project Cycle
		Project Teamwork
		Personnel Leadership, Coaching and Mentoring
		Project Risk Management
		Personal Development
		Project Performance Measurement and Assessment
		Operating Within NASA Environment
4. Science and Engineering	Human Spaceflight Mission Analysis and Design	An integrated view of crewed space mission design and operations, from mission objectives and requirements definition, through spacecraft design, development and test, to creating mission operations concepts and ground infrastructure capabilities
	Space Launch and Transportation Systems	An integrated view of space launch and transportation systems design and operations, from customer needs, objectives and requirements, through launch and transportation system design, development, test and manufacturing to creating operations, concepts and infrastructure capabilities
5. Personal and Professional Effectiveness, Leadership, and Supervisory	Challenges Facing the Technical Leader	Identify people skills vs. technical competence in managing technical functions
		Understand how to turn the characteristics of technical specialists into positive leadership skills
		Apply leadership techniques
		Learn new ways to develop yourself and your subordinates
	Communication Skills	Why adapting your communication style could prove critical to successful communication
		How "packaging" and "positioning" strategies can improve your communication with the next level of management
		Common communication missteps to avoid
		Feedback techniques that create positive change while leaving others feeling comfortable and confident
		How to bring out the best ideas in a team, increase involvement, and move a group quickly toward its objectives
	Conflict Management	Heighten your understanding of work behavior styles

Competency	Knowledge / Skills	Learning Objective
		Develop a better perception and awareness of yourself and your behavior patterns
		Learn about the differences of others and the environment required for maximum productivity and harmony in the work organization
		Learn to confront situations with responses which enhance productive growth and development
		Identify individualized strategies for coping with performance evaluations, giving and receiving assignments, and conducting team meetings
6. Computer and Information Technology	Life Cycle Cost Models	Basic knowledge and ability to use life cycle cost models

Executive Level

Competency	Knowledge / Skills	Learning Objective
1. Program/Project Management and Control	Program Management	Organizational Relationships
		Congressional Level Budgeting Concerns
		Leadership
		Strategic Planning and Goal Establishment
		Advocacy
		Relationship with Capitol Hill
		Executing the Budget
		External Environment
		Working with the Office of Management & Budget
2. Personal and Professional Effectiveness, Leadership, and Supervisory	Management Education Program	An understanding of an organization model and its component systems
		An understanding of NASA's past, present and future and how all Centers contribute to the larger NASA goals
		An analysis of the participant's own managerial practices with a comparison to practices that are most effective in NASA
		Steps that each participant can take to strengthen his or her managerial performance
		Simulations of team and organization performance
		Presentations and discussions of current theories, concepts and issues conducted by recognized experts in the fields of organizational management and behavior
		Discussions with several Associate Administrators or their deputies on current issues facing the Agency
	Managing the Influence Process	Creating and demonstrating a model of influence
		An analysis of the participant's own influence practices with a comparison to practices that are most effective in NASA
		Steps that each participant can take to strengthen their influence behaviors
		Simulations of team or organization performance

Competency	Knowledge / Skills	Learning Objective
		Presentations and discussions of current theories, concepts and issues conducted by recognized experts in the fields of organization behavior
		An understanding of NASA's past, present and future and how all Centers contribute to the larger NASA goals
		Discussions on current issues facing the Agency with several Associate Administrators or their deputies
	The Human Element	The overarching concepts of Truth and Choice as problem-solving tools for understanding human behavior
		The interpersonal behaviors of Inclusion, Control and Openness
		The underlying interpersonal feelings of Significance, Competence and Likeability
		The behaviors and feeling applied to the self: The Self-Concept and Self-Esteem
		Defense Mechanisms
		Health and Illness: The Mind-Body Connection
		Team Compatibility and Work Relations (This is where work-teams most benefit)
		Concordant Decision-Making
		Workshop methodologies include lecturettes, self-assessment instruments, Guided imagery, feedback, and non-verbal activities.
	Crossing Department Lines	Assess the effects of the participants' style of influence on their relationships with their peers
		Identify dynamics of effective team performance
		Identify methods for handling conflict and resolving differences among peers who are an integral part of the network of people whose cooperation the participant needs to get his/her job done
		Identify the opportunities participants have to increase their effectiveness and improve relationships with their peers.

Appendix E: Core Curriculum

The NASA cost estimating community has identified a group of recommended training areas in the technical competencies a person in cost estimating should take to perform his/her job competently. The following table lists these areas arrayed by job category and career stage. The courses marked with asterisks represent core courses highly recommended for cost estimators. Courses without asterisks are also recommended and can during later career stages as time allows.

Job Category: Cost Estimating & Analysis

Career Stage	Course Area
Entry	• Fundamentals of Cost Estimating and Analysis* • Fundamentals of Earned Value Management* • Fundamentals of Systems Acquisition Management* • Fundamentals of Business Financial Management* • Fundamentals of Engineering Economic Analysis* • Hardware Cost Models: NAFCOM, Price and SEER* • Risk Management* • Fundamentals of R&D Schedules • Fundamentals of Space Systems • Foundations of Project Management • NASA Organizations and Functions • Time & Stress Management • Understanding Space • Communication Skills • Basic Office Applications • Appropriations Law
Journey	• Professional Cost Estimating Certification • Intermediate Cost Estimating and Analysis* • Intermediate Earned Value Management* • Intermediate Systems Acquisition Management* • Cost Risk Analysis* • Economic Analysis* • Software Cost Estimating* • Hardware Cost Model Updates or Refresh: NAFCOM, Price and SEER* • Software Cost Models: Price and SEER* • Operating and Support Cost Analysis* • ACE-IT* • Business, Cost Estimating & Financial Management Workshop • Federal Budgeting for Non-Budget Personnel • Contractor Finance • Acquisition Business Management • Project Management • Systems Management • Fundamentals of Orbital and Launch Mechanics • Space Mission Analysis and Design • Advanced Degree • Leadership Skills for Non-Supervisors • Teamwork Skills • Advanced Office Applications

Career Stage	Course Area
Senior	• Hardware Cost Model Updates or Refresh: NAFCOM, Price and SEER* • Software Cost Model Updates or Refresh: Price and SEER* • EVM Training for Managers and Executives • Risk Management Refresh* • Advanced Project Management • Human Spaceflight Mission Analysis and Design • Space Launch and Transportation Systems • Executive Supervisory Skills • Leadership and Supervisory Skills • Life Cycle Cost Models • Congressional Operations • Advanced Degree
Executive	• Program Management • Management Education Program (MEP) • Managing the Influence Process (MIP) • Crossing Department Lines (CDL) • Advanced Degree • NASA Executive Fellowship Program

Appendix F: Training Providers

The following is a sampling of courses recommended for NASA cost estimators by training providers, identified by career stage, by competency, skill and learning objective:

Entry Level

Competency	Knowledge / Skill	Learning Objectives
1. Cost Estimating and Analysis	Fundamentals of systems acquisition management	• Fundamental precepts and bases of systems acquisition management • The diverse, interrelated, and changing nature in the different disciplines of systems acquisition management • The regulations and governing structures of systems acquisition management

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Fundamentals of Systems Acquisition Management (ACQ 101)	Defense Acquisition University	Distance Learning	NA	Systems acquisition management	

Competency	Knowledge / Skill	Learning Objectives
1. Cost Estimating and Analysis	Fundamentals of cost analysis	• Define cost data and apply appropriate quantitative techniques to estimate costs for major acquisition programs • Explain cost estimating policies • Perform a life-cycle cost analysis

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Fundamentals of Cost Analysis (BCF 101)	Defense Acquisition University	Resident/On-site	80	Cost Analysis	
CostProf	Society of Cost Estimating and Analysis	Self Paced/ On-site; NASA owns license for training for cost estimators at all Centers	40	Cost Estimating, Cost Analysis, Analytical Methods, Special Cost Methods, Management Applications	

Competency	Knowledge / Skill	Learning Objectives
1. Cost Estimating and Analysis	Fundamentals of earned value management	• Describe how EVM is used to plan and integrate cost, schedule, and technical program aspects and assess progress • Correlate contractors' management systems characteristics to the Guidelines in the EVM Systems Industry Standard EIA-748 • Recommend alternative EVM applications based on project risks • Explain the IBR process • Develop EACs based on project cost, schedule and technical data • Identify relevant acquisition organizations, key players and formal agreements

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Fundamentals of Earned Value Management (BCF 102)	Defense Acquisition University	Distance Learning	NA	Earned Value Management	
CostProf	Society of Cost Estimating and Analysis	Self Paced/On-site; NASA owns license for training for cost estimators at all Centers	40	Earned Value Management	

Competency	Knowledge / Skill	Learning Objectives
1. Cost Estimating and Analysis	Fundamentals of business financial management	• Describe the overall resource allocation process and identify the terminology and concepts used in analyzing the costs of acquisition programs • Explain the appropriations, policies, and practices applicable to developing a program budget • Examine the Planning, Programming and Budgeting System (PPBS) and the impact of programming and budgeting decisions on acquisition programs • Summarize the Congressional enactment process and the impact of Congressional actions of acquisition programs • Identify the processes by which budget authority is apportioned, executed in accordance with public law, and reprogrammed

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Fundamentals of Business Financial Management (BCF 103)	Defense Acquisition University	Distance Learning	NA	Business Financial Management	

Competency	Knowledge / Skill	Learning Objectives
2. Business Management	Knowledge of budget, cost accounting, cost/schedule management and program terminology, concepts, policies, and principles	• Demonstrate basic knowledge of budget, cost accounting, cost/schedule management and program terminology, concepts and principles • Describe applicable Agency, legislative, administrative, and regulatory requirements • Research questions concerning application of generally accepted budgeting principles

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Federal Budget Process	various	Classroom-Based	8	Federal Budget Process	
Appropriations Law	NASA Stennis Space Center	Classroom-Based	24	Appropriation Law	
Appropriations Law	NASA HQ (Management Concepts, Inc.)	Classroom-Based	32	Appropriation Law	
Appropriations Law Seminar 5111	Management Concepts, Inc.	Classroom-Based	32	Appropriation Law	

Competency	Knowledge / Skill	Learning Objectives
3. Program / Project Management and Control	Foundations of project management	• Basic Project Management Concepts • The Life Cycle Management Approach • Project Planning • Scheduling and Control Basics • NASA Program/Project Cost Estimating Techniques • NASA Program/Project Budgeting and Interaction with the Federal Budgeting Process • Project Data, Information and Configuration Management Processes • Contract Engineering and the Procurement Process • Contract and Project Baseline Management • Earned Value Management

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Foundations of Project Management	NASA Academy of Program and Project Leadership (APPEL)	Classroom-Based	32	Project Management	
Art of Project Management	various	Classroom-Based	24	Project Management	

Competency	Knowledge / Skill	Learning Objectives
4. Science and Engineering	Understanding space	• Basic knowledge and a "big picture" perspective about space technology, engineering and the business of space.

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Understanding Space Seminar	Various	Classroom-based	16	Space Technology	

Competency	Knowledge / Skill	Learning Objectives
5. Personal and Professional Effectiveness, Leadership, and Supervisory	Time & Stress Management	• Basic knowledge of time management to improve performance and reduce stress • Minimize crisis by encouraging proper planning • Organize and access critical information associated with your planning tool • Focus on high-leverage activities that will increase return on investment • Create a healthy balance between personal and professional development • Share a common vision and mission that creates unity among team members

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Stress Management: A Psychological, Physiological and Practical Overview	Various	Classroom-Based	4	Stress management	
Time Management	Various	Classroom-Based	8	Time Management	

Competency	Knowledge / Skill	Learning Objectives
5. Personal and Professional Effectiveness, Leadership, and Supervisory	Communication Skills	• Basic knowledge of effective writing skills • Basic knowledge of effective speaking and oral presentation skills

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Dynamics of Daily Negotiation	various	Classroom	8	Negotiation skills	
Effective Presentation Skills	various	Classroom	4	Presentation skills	
Public Speaking as a Two-Way Dialogue	various	Classroom	8	Public Speaking	
Writing Effective Email	various	Classroom	16	Writing	
Writing that Works	various	Classroom	16.5	Writing	

Competency	Knowledge / Skill	Learning Objectives
6. Computer and Information Technology	Basic office applications: operating system, web browsing, email, word processing, spreadsheet, presentation graphics	• Basic knowledge and ability to use personal computer software including operating system, email, web browser, word processing, spreadsheet and presentation applications.

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Basic Microsoft Outlook	various				
Basic Microsoft Word	various				
Basic Microsoft Excel	various				
Basic Microsoft PowerPoint	various				

Competency	Knowledge / Skill	Learning Objectives
6. Computer and Information Technology	Hardware cost models	• Basic knowledge of NAFCOM, PRICE H, SEER H

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
NAFCOM	SAIC	Classroom	16	NAFCOM	
PRICE H	PRICE SYSTEMS	Classroom	40	PRICE H	
SEER H	Galorath	Classroom	40	PRICE H	

Journey Level

Competency	Knowledge / Skill	Learning Objectives
1. Cost Estimating and Analysis	Intermediate systems acquisition management	• Enhance and apply knowledge of the business, technical, and managerial aspects of acquisition • Understand and appreciate the critical role that each functional discipline plays in the acquisition process • Effectively participate in integrated product teams to develop plans and resolve problems

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Intermediate Systems Acquisition Management (ACQ 201)	Defense Acquisition University	Distance Learning & Resident/On-site	Self Paced + 40 hours	Systems acquisition management	

Competency	Knowledge / Skill	Learning Objectives
1. Cost Estimating and Analysis	Intermediate cost analysis	• Understand the cost estimating process • Normalize data for content, quantity, and economic year • Develop cost estimates using various techniques • Document cost models and estimates • Apply time-phasing techniques in development, production and operation and support phases of the life cycle, including cost improvement curves • Understand and perform sensitivity and risk analysis of an estimate

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Intermediate Cost Analysis (BCF 204)	Defense Acquisition University	Resident/On-site	120	Cost Analysis	

Competency	Knowledge / Skill	Learning Objectives
1. Cost Estimating and Analysis	Intermediate earned value management	• Synthesize the relationship between EVM and acquisition management • Prepare EVM requirements for the RFP • Evaluate a contractor's management systems against the 32 EVM Guidelines • Synthesize the planning, organization, execution, and follow-up of an integrated baseline review • Identify working relationships of stakeholders • Use EVM techniques and automated tools to analyze information from the Cost Performance Report and critical path scheduling tools to assess and report a contractor's cost and schedule performance

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Intermediate Earned Value Management (BCF 203)	Defense Acquisition University	Resident	80	Earned Value Management	

Competency	Knowledge / Skill	Learning Objectives
1. Cost Estimating and Analysis	Contractor finance	• Recognize and analyze financial and business issues • Use the vocabulary and concepts necessary to discuss these issues with the contractor community

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Contractor Business Strategies (BCF 205)	Defense Acquisition University	Resident/On-site	40	Contractor finance	

Competency	Knowledge / Skill	Learning Objectives
2. Business Management	Knowledge of budget, cost accounting, cost/schedule management and program terminology, concepts, policies, and principles	• Prepare, justify, and defend budget exhibits and obligation/expenditure plans • Formulate impact/reclama statements and reports • develop and defend business aspect of the acquisition cycle

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Acquisition Business Management (BCF 211)	Defense Acquisition University	Hybrid Distance Learning and Resident	40 hr classroom	Acquisition business management	
Operating and Support Cost Analysis (BCF 215)	Defense Acquisition University	Resident/On-site	72	Business, Cost Estimating & Financial Management	

Competency	Knowledge / Skill	Learning Objectives
2. Business Management	Business, Cost Estimating & Financial Management	• Explain the tasks and duties of BCEFM functions • Define current BCEFM-related laws, regulations, policies and procedures • Evaluate the interrelationships among the BCEFM functions • Point out the appropriate decision-making information based on the integrated nature of a BCEFM task

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Business, Cost Estimating & Financial Management Workshop (BCF 301)	Defense Acquisition University	Resident/ On-site	72	Business, Cost Estimating & Financial Management	
Economic Analysis (BCF 207)	Defense Acquisition University	Resident/ On-site	40	Business, Cost Estimating & Financial Management	
Principles of Schedule Management (BCF 263)	Defense Acquisition University	Resident/ On-site	24	Business, Cost Estimating & Financial Management	
Software Cost Estimating (BCF 208)	Defense Acquisition University	Resident/ On-site	40	Business, Cost Estimating & Financial Management	

Competency	Knowledge / Skill	Learning Objectives
3. Program / Project Management and Control	Project management	• Possess a basic understanding of project management and related issues. • Critical Tools and Techniques Used in the Technical Management of Projects • Tools and Techniques for the Effective Management of Teams and Project Members • Future Trends of Project Management from the Perspective of Both Internal and External Leaders in the Project Management Business and Allied Fields • Best Practices Emerging from NASA Research and Experience Papers • Other Institutional Approaches to Managing Projects and Establishing Critical Networks for Future Success

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Project Management	NASA Academy of Program and Project Leadership (APPL)	Classroom-Based	88	Project Management	
Program Management Tools (PMT 250)	Defense Acquisition University	Distance Learning	56	Project Management	

Competency	Knowledge / Skill	Learning Objectives
3. Program / Project Management and Control	Systems management	• Describe the project system engineering process • Direct the project requirements development process • Manage the system architecture development including concept tradeoffs • Direct integration of system components and verify that requirements have been met • Manage system documentation, data configuration management and flow

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Systems Management	NASA Academy of Program and Project Leadership (APPL)	Classroom-Based	28	Systems management	

Competency	Knowledge / Skill	Learning Objectives
4. Science and Engineering	Fundamentals of Orbital and Launch Mechanics	• Familiarity with the principles, major tools, and analysis techniques necessary to make the design choices and operational decisions required for overall space flight mission success

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Fundamentals of Orbital and Launch Mechanics	various	Classroom-based	24	Orbital and Launch Mechanics	

Competency	Knowledge / Skill	Learning Objectives
4. Science and Engineering	Space Mission Analysis and Design	• An integrated view of space mission design and operations, from mission objectives and requirements definition, through spacecraft design, development and test, to creating mission operations concepts and ground infrastructure capabilities

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Space Mission Analysis and Design	various	Classroom-based	40	Space Mission Analysis and Design	

Competency	Knowledge / Skill	Learning Objectives
5. Personal and Professional Effectiveness, Leadership, and Supervisory	Teamwork Skills	• Develop a shared understanding and common vocabulary necessary for effective leadership • Gain insight into effective leadership skills • Identify and assess your personal leadership strengths and limitations through a variety of assessment instruments • Gain greater self-awareness and insight into your work behavior patterns, interpersonal skills, and personality traits.

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Situational Leadership	various	Classroom	4	Situational leadership	
Assessing Your Leadership Skills	various	Classroom	16	Leadership assessment	
Influencing Others	various	Classroom	16	Situational leadership	
Crossroads	various	Classroom	16	Leadership assessment	
Crossing Department Lines	various	Classroom	16	Collaborative work	

Competency	Knowledge / Skill	Learning Objectives
6. Computer and Information Technology	Advanced office applications: project management, database, website development tools	• Basic knowledge and ability to use advanced office application software including project management, database and web site development tools.

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Microsoft Project	various				
Microsoft Access	various				
Microsoft Frontpage	various				

Competency	Knowledge / Skill	Learning Objectives
6. Computer and Information Technology	Software Cost Models	• Basic knowledge and ability to use parametric software cost models, including: COCOMO, PRICE S, and SEER SEM

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
COCOMO	Various	Classroom			
PRICE S	PRICE Systems	Classroom			
SEER SEM	Galorath	Classroom			
Software Acquisition Management (SAM -101)	Defense Acquisition University	Distance Learning		Software Cost Estimating	

Senior Level

Competency	Knowledge / Skill	Learning Objectives
1. Cost Estimating and Analysis	Software Cost Estimating	• Describe the software acquisition process • Determine an appropriate cost estimating method and the types of data required for a software estimate • use models for software life cycle cost estimating • Compare and contrast alternative techniques for software cost estimating • Apply software cost estimating techniques • Discuss the strengths and weaknesses of software cost estimating models • Discuss major influences on software cost estimating

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Advanced Software Acquisition Management (SAM 301)	Defense Acquisition University	Resident/On-site	72	Software Cost Estimating	
Intermediate Software Acquisition Management (SAM 201)	Defense Acquisition University	Resident/On-site	40	Software Cost Estimating	

Competency	Knowledge / Skill	Learning Objectives
1. Cost Estimating and Analysis	Operating & Support Cost Analysis	• Recognize the full spectrum of costs included in O&S cost estimates • Plan and perform an O&S cost estimate • Obtain and normalize O&S data • Apply appropriate cost estimating methods and models • Document cost models and cost estimates • Apply economic analysis tools to evaluate alternative courses of action

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Operating & Support Cost Analysis (BCF 215)	Defense Acquisition University	Resident	40	Operating & Support Cost Analysis	

Competency	Knowledge / Skill	Learning Objectives
1. Cost Estimating and Analysis	Cost Risk Analysis	• Assess subjective probabilities to represent uncertain cost elements in an acquisition program • Model the cost risk associated with a program • Judge the reasonableness of a cost risk analysis

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Cost Risk Analysis	Defense Acquisition University	Resident/On-site	40	Cost Risk Analysis	

Competency	Knowledge / Skill	Learning Objectives
1. Cost Estimating and Analysis	Economic Analysis	• Determine the most cost-effective way of conducting NASA business • Determine the alternative that will warrant the highest benefits • Estimate the cost of competing alternatives • Assess the uncertainty that may exist, using sensitivity analysis and prior estimates of benefits and cost of competing alternatives • Provide a rationale for conclusions

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Economic Analysis (BCF 207)	Defense Acquisition University	Resident/On-site	32	Economic Analysis	

Competency	Knowledge / Skill	Learning Objectives
3. Program / Project Management and Control	Advanced Project Management	• Selection and Application of the Appropriate Tools of Life Cycle Management • Tailoring the Project Cycle • Project Teamwork • Personnel Leadership, Coaching and Mentoring • Project Risk Management • Personal Development • Project Performance Measurement and Assessment • Operating Within NASA Environment

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Advanced Project Management	NASA Academy of Program and Project Leadership	Resident	88	Advanced Project Management	

Competency	Knowledge / Skill	Learning Objectives
4. Science and Engineering	Human Spaceflight Mission Analysis and Design	• An integrated view of crewed space mission design and operations, from mission objectives and requirements definition, through spacecraft design, development and test, to creating mission operations concepts and ground infrastructure capabilities

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Human Spaceflight Mission Analysis and Design	various	Classroom	40	Human Spaceflight Mission Analysis and Design	

Competency	Knowledge / Skill	Learning Objectives
4. Science and Engineering	Space Launch and Transportation Systems	

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Space Launch and Transportation Systems	various	Classroom	24	Space Launch and Transportation Systems	

Competency	Knowledge / Skill	Learning Objectives
5. Personal and Professional Effectiveness, Leadership, and Supervisory	Leadership Skills	• Identify people skills vs. technical competence in managing technical functions • Understand how to turn the characteristics of technical specialists into positive leadership skills • Apply leadership techniques • Learn new ways to develop yourself and your subordinates

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Challenges Facing the Technical Leader	various	Classroom	8	Leadership Skills	
Communication Skills for the Technical Professional	various	Classroom	8	Leadership Skills	
Conflict Management for Supervisors and Team Leads	various	Classroom	8	Leadership Skills	

Competency	Knowledge / Skill	Learning Objectives
6. Computer and Information Technology	Life Cycle Cost Models	• Basic knowledge and ability to use life cycle cost models

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
PRICE HL	PRICE Systems	Classroom		PRICE HL	
MESSOC	JPL	Classroom		MESSOC	

Executive Level

Competency	Knowledge / Skill	Learning Objectives
1. Program / Project Management and Control	Program Management	• Organizational Relationships • Congressional Level Budgeting Concerns • Leadership • Strategic Planning and Goal Establishment • Advocacy • Relationship with Capitol Hill • Executing the Budget • External Environment • Working with the Office of Management & Budget

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Program Management	NASA Academy of Program and Project Leadership	Resident	40	Program Management	
The Program Managers Course	Defense Acquisition University	Resident/On-site	10 weeks	Program Management	
Executive Program Managers Course	Defense Acquisition University	Distance and Resident/ On-site		Program Management	

Competency	Knowledge / Skill	Learning Objectives
2. Personal and Professional Effectiveness, Leadership, and Supervisory	Leadership Skills	• Successfully motivate their employees, manage change and develop as the future leaders of our organization

Course Listings

Course Name	Training Provider	Methodology	Duration (hr)	Primary Topics	Tracking No.
Management Education Program (MEP)	Management Education Center, Wallops Island, Virginia	Resident	72	Leadership skills	
Managing the Influence Process (MIP)	Management Education Center, Wallops Island, Virginia	Resident	72	Leadership skills	
The Human Element (THE)	Management Education Center, Wallops Island, Virginia	Resident	48	Leadership skills	
Crossing Department Lines (CDL)	Management Education Center, Wallops Island, Virginia	Resident	40	Leadership skills	

Appendix G: Training Providers and Other Training Links

- Defense Acquisition University
  http://www.dau.mil/schedules/schedule.asp
- Fellowships
  http://fellowship.nasa.gov/
- Galorath – SEER Training
  http://www.galorath.com/consult_train.html
- MCR Training

  http://www.mcri.com/training/costanalysistraining.asp
- NASA Leadership and Management Development
  http://www.leadership.nasa.gov/Development/NASA_Programs.htm
- NASA Leadership Development Program

  http://ldp.nasa.gov/
- NASA Academy of Program and Project Leadership (APPL)
  http://appel.nasa.gov/
- NASA FIRST
  http://www.leadership.nasa.gov/nasa_first/home.htm
- NASA HQ
  http://nasapeople.nasa.gov/training/
- NASA Agency Wide Training Schedule
  http://nasapeople.nasa.gov/training/documents/FY08AgencywideCalendar_83107.pdf
- PRICE Systems
  http://www.pricesystems.com/services/public_training_schedule.asp
- Senior Executive Development Program
  http://nasapeople.nasa.gov/training/devprogs/sescdp.html
- Tecolote Research: ACE-IT Classes

  http://www.tecolote.com/Products/ProductsHome.html

Appendix H: Mentoring and Coaching

Mentoring involves counseling others, through formal or informal methods. A mentor willingly serves as a role model for his/her protégé, sharing organization insights and lessons learned. Mentors provide sound advice on career development goals, strategies, and options.

Mentoring involves guiding and nurturing the growth of others through various stages of their development. Mentoring is a technique with strategies and practices that can be learned. Generally speaking, a mentor is someone of substantial experience, talent or professional standing who nurtures the career of a protégé (e.g., apprentice, intern or understudy). Mentoring can be conducted through a formal program or by an informal understanding between a mentor and protégé. The best mentors combine technical competence, business acumen, relevant experience, the ability to effectively communicate, and most importantly the ability to listen and provide candid and constructive feedback.

A mentor's role includes:

- Assisting you with recommendations for training and work experience at each career level
- Working with individuals so that the employee can seek appropriate assignments
- Acting as a sounding board for career decisions, and providing information about important organizational issues
- Meeting frequently and regularly with you to review progress.

The key steps in the mentoring process include:

- Reviewing this Guide
- Generating a personal vision
- Holding career discussions with your supervisor
- Holding career discussions with your mentor(s).

Mentoring may be performed by managers or non-managers, either internal or external to an employee's organization. NASA cost estimators are encouraged to seek an appropriate mentor(s). However, whether or not you have a mentor-protégé relationship is entirely up to you. Employees may choose to have more than one mentor. You and your supervisor should discuss the need for a mentor.

Coaching involves clearly communicating performance expectations to peers and employees, and openly sharing information for the benefit of the organization. Coaches also model and communicate the values, behaviors, and work practices expected of the workforce. Like a mentor, coaches provide constructive feedback. Coaching is normally done in the context of a supervisor-employee relationship, and can be a daily activity.